AUGUST, 1942

PUBLIC WORKS

Streets and Highways . . . Water Works
Sewage Disposal . . . Airports

POZZOLITH (CEMENT DISPERSION)

Simplified Difficult Placing Problem... Secured Strength and Durability...

Permanent Construction Co.
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7016 Euclid Avenue,
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Gentlemen:-

The construction of the Gary Sewage Treatment Plant, Gary, Indiana, on which Alvord, Burdick & Howson of Chicago, Illinois, were the engineers, involved the placing of 25,000 yards of concrete, a large portion of which is contained in thin walls and slabs.

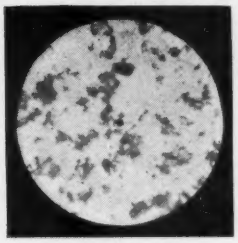
Rigid control of the concrete mix for strength and durability indicated that a tough job of placing concrete was ahead. The use of Pozzolith simplified a difficult concrete placing problem.

The addition of Pozzolith increased the workability and plasticity of the concrete with no increase in the water cement ratio, greatly facilitating the placing and finishing operations.

Pozzolith was used in this project with very gratifying results.

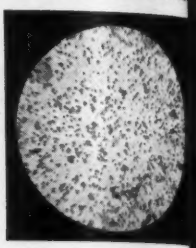
Very truly yours,
PERMANENT CONSTRUCTION CO.
Errol Williamson
Vice President.

HOW CEMENT DISPERSION WORKS



Cement suspended in water
UNDISPERSED
WITHOUT POZZOLITH

In a normal concrete mix, cement particles tend to bunch together, thereby (1) limiting hydration and (2) trapping water within the cement clumps. (See photomicrograph above).



Cement suspended in water
DISPERSED
WITH POZZOLITH

Cement Dispersion drives these particles apart and (1) exposes their entire surface area to hydration, at the same time (2) making the water entrapped in the clumps available for lubrication of the mix. (See photomicrograph above).

Find out how Cement Dispersion produces greater speed, workability, placeability, watertightness and durability and reduces costs. Send for copy of illustrated Pozzolith booklet today.

THE MASTER BUILDERS CO.
CLEVELAND, OHIO TORONTO, CANADA

MASTER BUILDERS

THE WAR EMERGENCY

Are Water Works Hoarding Critical Materials?

The Secretary of the American Water Works Association a few days ago sent to water works managers and superintendents a letter marked "Important," from which the following paragraphs are quoted. It referred to reports returned by cities of 50,000 population or more to the War Production Board, covering materials obtained and inventoried for the first quarter of 1942.

"While fuel and water purification chemicals have been for some time not included in the inventory restrictions, all other maintenance and repair materials have been restricted to 'a practical working minimum' —which was taken to be your 1940 inventory. Your collective records show that at the end of the first quarter of 1942, you had in inventory 120% of your 1940 recorded inventory. In dollars and cents, the figures show an *increase* of 7.77¢ per capita served, or for the 82,000,000 persons estimated as presently receiving public water service, more than six and a quarter million dollars worth of critical materials. This is a very serious matter which can have adverse effects upon all water works activities, since the impression now exists that water works men are hoarding critical materials, while the record shows that for both the electric and gas industries, the inventories are lower than they were in 1940.

"Another very unfortunate situation results from the fact that your collective records show deliveries to water works in the first quarter of 1942 at the annual rate of 61.96¢ per capita and withdrawals at the annual rate of only 53.33¢ per capita, an excess income of materials within the first quarter of 8.63¢ per capita.

"Increased inventory for civilian defense or plant protection cannot be set up under the open terms of P-46 but must be based upon special authorization from the WPB. However greatly you may feel that such materials are needed, you cannot acquire them without authorization. If you have acquired them and they appear in your inventory under P-46, those circumstances, in so far as they go, contribute to the unfortunate record which has been discussed herein.

"There is a definite intention within the Power Branch of the WPB to call upon water works having surplus inventory to make such surplus available to plants or projects having an immediate need for such materials to construct facilities imperatively needed in the war effort. I shall do all that can be reasonably done to protect water works inventories based upon good practice, but I am, and shall continue to be unable to defend such an increase in inventory of critical materials as appears to be shown by the present record. I therefore suggest the following alternate procedures on your part—

"(1) Satisfy yourself that your inventory of repair and maintenance material is no greater in dollar volume than it was in 1940, or

"(2) File with the Power Branch of the War Production Board, *at once,* a list of surplus material that you are prepared to release under the terms of P-46 as it is now amended."

The amendment of P-46 referred to, issued July 8th, is as follows:

Sales of Materials from Excess Stocks.—Any producer may sell to any other producer materials from the seller's excess stocks or inventories, provided that a preference rating of A-5 or higher assigned by this order, or any preference rating certificate, order, or other direction issued by the Director of Industry Operations, is applied or extended to the producer selling such materials; and any such sale shall be expressly permitted within the terms of paragraph (c) (2) (iii) of Priorities Regulation No. 13.

Lead an "Available" Material

The War Production Board on July 2nd announced that lead had been dropped in Group III Materials, described as those "materials that are available in significant quantities as substitutes for less available materials, and materials that are available in large amounts unless restrictions are imposed by labor, manufacturing, or transportation difficulties."

Materials Available for Service Pipe

Copper pipe cannot be purchased for water services or other non-war purposes. Instead, there are available pipe of lead ¾" and up, cast iron 1½" and up, wrought iron in all sizes (availability limited) and two new materials — "Tube-Loy" (a lead alloy) in sizes ¾" and up, and "Saran" (a plastic). The last named is furnished in ¾" od size, cannot be used for hot water; the heaviest has a bursting pressure exceeding 1,000 psi.

The War Production Board in July placed all supplies of high-test calcium hypochlorite and chloride of lime under complete allocation control.

New Service for Applicants for Priority Assistance

J. S. Knowlson, Director of Industry Operations, has announced that if applicants who use individual PD-1A certificates will enclose with their application blank a self-addressed post card, the case number assigned to their application will be stamped on the card, and it will be returned to them to facilitate handling of subsequent inquiries with respect to the application. All inquiries concerning applications should be submitted in writing.

In order to avoid unnecessary correspondence, applicants are requested not to make inquiries concerning their cases for two weeks after they have been received by WPB. This is the maximum time normally required to process an application, and usually the application will either be granted or denied in a shorter time. If there is a delay beyond two weeks, or if for any reason supplementary information is submitted, use of the case number in correspondence will expedite handling and assure a prompt reply.

(Continued on page 38)

Beyond..

THE SCOPE OF A SCREEN ANALYSIS

If one has the choice of sweeping a floor with a rake or a broom, obviously the broom will be the implement chosen. The prongs of the rake are plenty strong enough to remove the dirt from the floor but since they can't cover the entire surface their strength is wasted.

Just so with activated carbon in the water plant. That is, a carbon small in particle size and light in weight presents immeasurably more effective surface for removing taste and odors. We describe this property as "dispersion." For use in water plants, the dispersion of activated carbon represents a very important feature by working hand in hand with the carbon's activity for removing taste and odors.

Microscopic study reveals the physical characteristics of activated carbon. Work recently conducted by a commercial microscopist gives the following results in particles per gram for various activated carbons being offered for water treatment:

CARBON	Billions of particles per Gram	Average particle size (Diameter in microns)
A	10.0	3.85
B	28.4	2.7
C	72.0	2.0
AQUA NUCHAR	120.0	1.65

Since the ultimate particle size of AQUA NUCHAR Activated Carbon is extremely fine, it readily separates on dispersion. Many of these smaller particles are aggregates of still smaller particles so that the microscopic count gives us a more effective picture than a screen analysis in showing how these particles break away from one another to form individual units for thoroughly sweeping up taste and odor bodies present in water.

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When you need special information—consult the *classified* READER'S SERVICE DEPT., pages 47-49

PUBLIC WORKS Magazine . . . AUGUST, 1942

VOL. 73. NO. 8

Digging out end of rail and starting lifting operation.

Salvaging Two Thousand Tons of Street Car Rails for War Needs

By MURRAY M. SMITH

Village Engineer, Grosse Pointe Farms, Michigan

How a village is removing more than two miles of double-track from its street and restoring the street surface to a better-than-before condition.

THE village of Grosse Pointe Farms, a residential suburb of Detroit, was the first community in the State of Michigan to attack the problem of street car track removal as a war salvage measure. The problem was a double one—the physical one of how best to remove the tracks, and the financial one of how to do this at minimum cost to the taxpayers. We have demonstrated that, sponsoring this as a WPA project with Federal contribution of all necessary labor and equipment, the cost to the village of all materials necessary to remove street car tracks embedded in a concrete pavement and to repave the street with an up-to-date surface will be covered by the salvage value of the rails.

The rails to be removed extended as a double track for a distance of 12,000 ft. down the center of Grosse Pointe Blvd. The paved roadway is 47 ft. wide, of which

Ripping out tracks, using a Caterpillar Diesel and Le Tourneau ripper.

Car tracks out and the rubble ready to be shoveled into the mixer.

17 ft. in the center was affected by the car track removal. This 17 ft. width has a pavement thickness of 23 inches, of which 8 inches is concrete base, on which is 8 inches of concrete in which are embedded white oak ties, and on these are spiked 7-inch 91-pound T traction rails which also are embedded in concrete; there being a sand cushion cleavage joint at the level of the top of the ties. The ends of all rails were welded together with 220-pound thermit welds.

In an effort to determine the best method both for rail removal and for pavement replacement, we experimented with the first 1,000 lineal feet of the job, bearing in mind the fact that the easiest method of removing the rails might result in more costly pavement replacement. First of all it seemed clear that economy would be served if any or all materials removed, aside from the rails, could be used in the restoration of the street surface. This would eliminate or reduce not only the cost of purchasing new aggregates but also that of disposing of the broken concrete.

Sections of the concrete pavement between the rails had disintegrated so badly that in 1939 approximately $6,000 was spent for "build-up" and "double seal" maintenance work. We therefore decided to rip up a section of the car tracks, breaking the pavement for the full 17-foot width of railway structure and to the depth of the ties, and then attempt to repave either by water binding the broken concrete, using additional fines, or by merely rolling with a 10-ton tandem roller and penetrating with some bituminous binder.

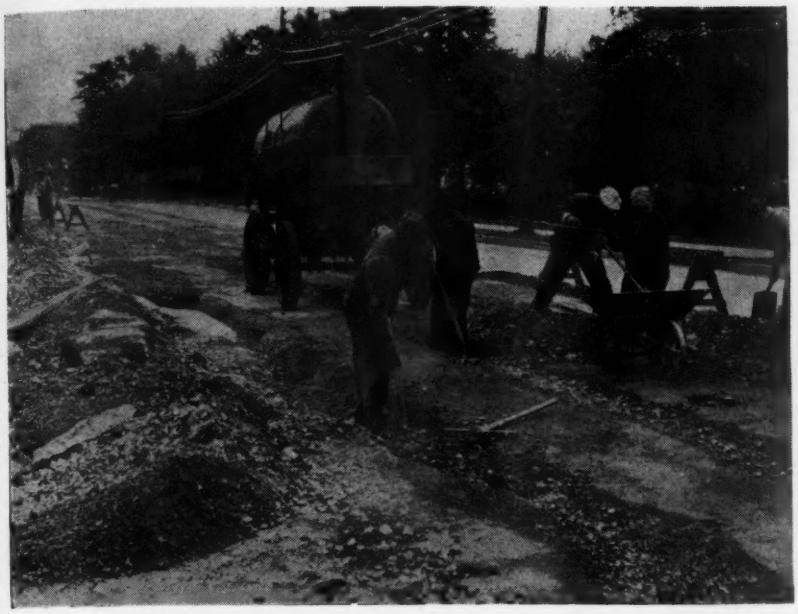
We learned two important facts from trying the above method; first, that we could take rails out very rapidly, actually pulling a 60-foot rail out of solid concrete in about two minutes; and second, that the concrete around the rails was a lot harder and not nearly as disintegrated as we had thought. It therefore appeared more logical from all angles to plan on removing as little concrete as possible from around the rails, with the thought that the concrete between the rails was more stable if left undisturbed than if it were broken down and rolled with a binder back into the pavement.

The final plan for rail removal developed into trenching along both sides of each rail, using six concrete breakers operated by three air compressors. The result

The mix being placed in the trench and rolled.

was four trenches, each approximately 18 inches wide. Each rail was then removed from its trench by sliding the loop of a heavy logging chain under the exposed end and alternately lifting and sliding the looped chain under the rail in 6-foot or 8-foot bights. The lifting and sliding operation was done by a Le Tourneau road ripper from which the logging chain was hung. The ripper was attached to and operated by a D-7 Caterpillar tractor. Steel tie-bars connected the rails at six-foot intervals and, being embedded in the concrete, naturally had to be cut before the rail could be lifted.

Work extends for a distance of 600 to 800 feet along the street and consists of three operations carried on simultaneously by three separate crews of workers.



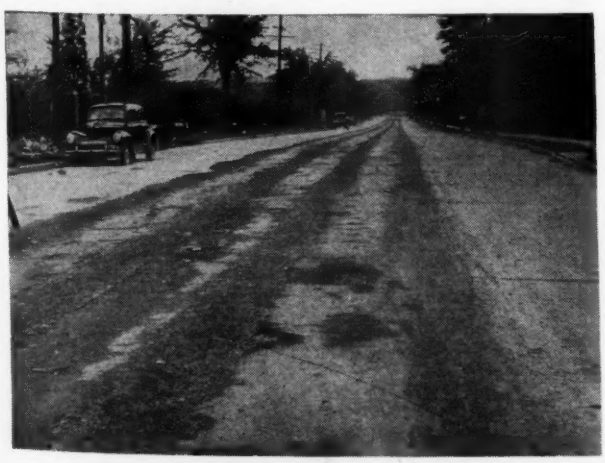
Cleaning trenches, showing size of material. Only the fines are used for repairing.

Murray M. Smith

Each of the three crews consisted of 12 to 15 men. The first crew performs the trenching operation explained above; using six busters it can trench out 150 lineal feet of double track a day, which is equivalent to 600 lineal feet of trench and rail. The concrete busters are operated by three air compressors, one Gardner Denver and two Le Roi.

The second operation is carried on by a crew who work with the tractor, lifting the rail, cutting it into 3-foot lengths, cleaning off the concrete and carrying the rail outside the curb, where it is piled ready for loading. This crew also cleans all the broken concrete out of the trenches, stock piling it alongside the job in a windrow. All trenches are swept and cleaned of loose materials. The rails were at first cut in 15-foot lengths, but handling these 500-pound lengths was hard on the men. We receive $2.00 more per ton for the 3-foot lengths, while the additional cost for labor is $1.00 and for oxygen and acetylene 70 cents. All cutting of rails and tie-bars is done by an acetylene cutting torch.

The third operation is that of repaving, which is the most important to the engineers and is the one that requires careful control. This operation consists of mixing the broken concrete, just as it comes out of the trenches, with tar and then placing the mix back into the trenches and rolling it. The equipment for this operation consists of a 7 cubic foot, gas-operated concrete mixer, a 600-gallon tank wagon with means for heating, a 10-ton tandem roller, half a dozen wheelbarrows and two large plumbers' torches.



The job completed and ready for the double seal coat.

No grading is done of the broken concrete as it comes out of the trenches from the breakers, but it runs in all sizes from 2½ or 3 inches down to dust. The trenches are from 7 to 8 inches deep and the men are told not to use any pieces larger than one-half the depth of the trench. The mix is field controlled, or in other words, is varied on the job depending on the temperature and the moisture in the aggregate.

The bituminous binder used is a State Highway Department Specification road tar T-8, which is delivered on the job hot and transferred into the tank wagon, where it is held at between 150 and 200 degrees by means of a coal fire maintained under the tanks. In batching, it was found that, under good conditions, 5 cubic feet of broken concrete mixed with 3 gallons of tar provided a uniformly coated batch. In the morning, when the aggregate was cold, or after rains, when the moisture content was high, we had to use small amounts of tar solvent to get a well-coated material. We were able to work under some rather bad temperature and moisture conditions and still get good results. One important thing that we found well worth while was placing two plumbers' torches under the drum of the mixer. The heat from these torches kept the tar from coating the inside of the drum and also reduced the time of mixing.

The average time per batch for mixing and discharging into wheelbarrows was five minutes. The mix was then dumped from the wheelbarrows into the trenches and by means of rakes was carefully rounded up over the trenches to a height of two to three inches above the top of the pavement, and was permitted to stand for several hours before being compacted by rolling to the level of the pavement. The area was immediately opened to traffic, and it is planned to permit the traffic to further compact the mix in the trenches for several months, or until the job has been com-

(Continued on page 22)

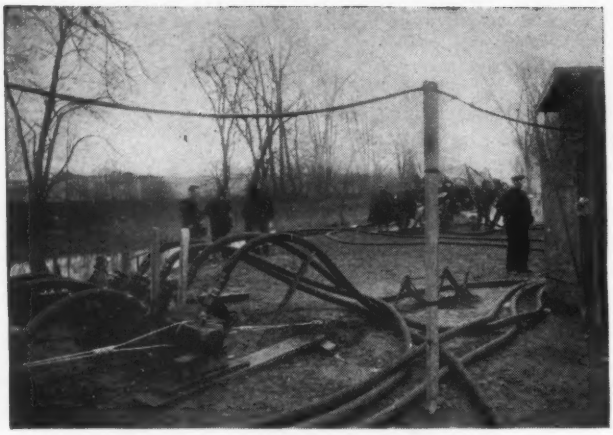


Fig. 2—Details of manifold. Chlorinator house at right.

Emergency Water Supply P

By J. McCLURE WARDLE
Supt. of Public Works and City Engineer, Hudson, New York

WE HAD a drouth last Fall. That will hand most readers a laugh. These dry spells seem to have gotten free from the old sun spot cycle and now clip us at will—the last one giving only two years breathing spell since 1939. One would think we'd finally reason that if they come at all we must be prepared with an adequate water supply to pull us through, because how could anyone reason that it would be all right to go without water once every eleven years. So it usually finds us the same as before hoping and praying for rain and brow beating the consumers to get the consumption down to a point where we get through with a squeak.

The City of Hudson has done its share of squeaking, not because it's tight—we've spent thousands for streets—but because our municipal water system has been functioning by gravity and good luck since 1905; and not that the reasoning of our people has deteriorated as much as the inside of our pipes, but rather because, when we've been short of water—and pulled through, the situation has been dismissed with the explanation that it was just a dry year and probably other communities were short too. Perish the thought that the supply can barely meet the normal demand.

When we don't pull through—but that's the reason for this writing. That's an emergency and calls for prompt action—prompt not meaning hurried. Most emergencies can be anticipated or at least imagined. When we read of emergency steps being taken we can generally assume that this action is the culmination of careful and previous unhurried planning.

Several years ago our plan was born. Recurring shortages due to drouth, and consequent depletion of our storage, or under-capacity of our supply main at peak or abnormal demands, caused us to consider combining an auxiliary supply with booster pumping. A site was selected where our pipe line crossed Claverack Creek about two miles east of the city. Here it would be possible either to pump creek water into the normally gravity main or to boost our regular gravity supply, thereby increasing the capacity of the 16" main to about 3 M.G.D. This plan had the excellent aspect of protecting us against any occurrence, drouth or line failure, in any part of the outlying 11 miles of single-line system and 85-million-gallon storage reservoir. We gauged the minimum creek flow and the capacity of the gravity supply main under known conditions of natural head; took static, flowing, and surge pressures; and in general thoroughly investigated the hydraulics of the problem, from which computations showed what characteristics

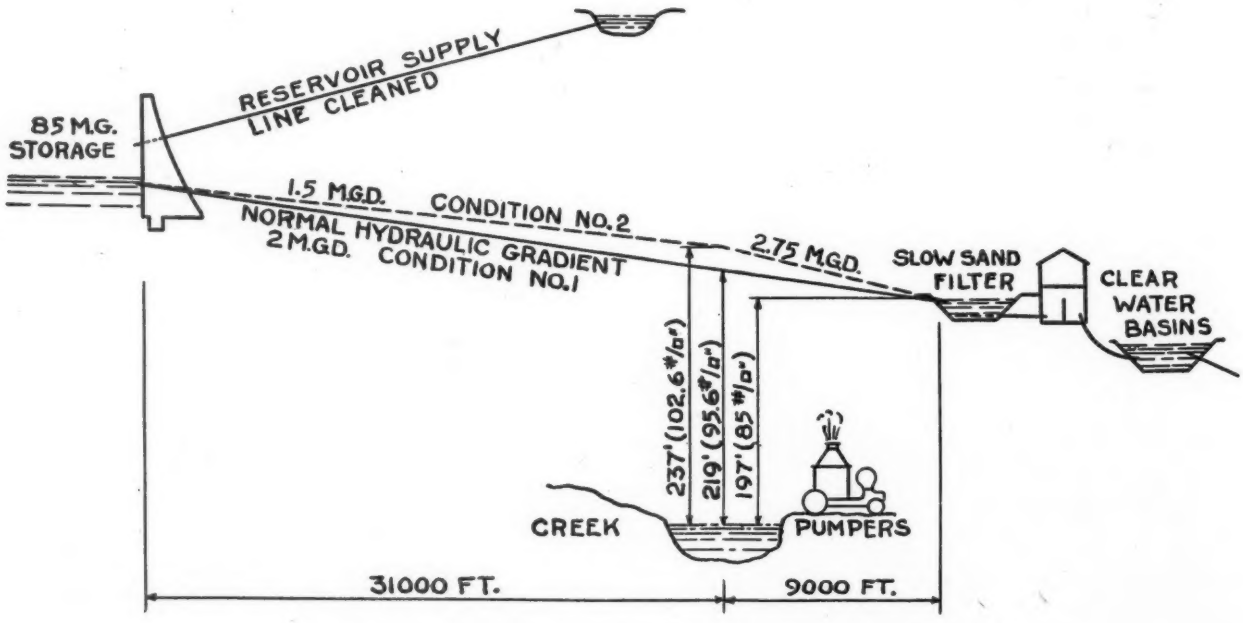


Fig. 4—Schematic diagram showing hydraulics of emergency pumping.

Pumping With Fire Engines

The City of Hudson, N. Y., used two fire engines for pumping into its reservoirs under a hundred-pound head two million gallons a day of chlorinated creek water, which was filtered before use.

Fig. 1—Manifold, with connection to main. Pumper at rear. Chlorinator house at left.

as to head, etc., the proposed pumps should have; and of course, the expected performance under various operating conditions.

When plans for this permanent emergency station failed to win sufficient support for its authorization, disappointment did not prevent us from considering the auxiliary supply feature of the plan as the most feasible means of an emergency supply with a temporary set up. Armed with the pumping data mentioned, we approached each threatened shortage with the thought that somewhere, somehow, we'd get portable pumps and take them to the creek.

Early in December of last year our previous good luck ran out with the last bit of water in our storage. In November, anticipating this possibility, we endeavored unsuccessfully to get suitable pumps. Fire pumpers were considered. A study of the schematic hydraulic sketch (Fig. 4) shows that from the creek to the filter, 2 M.G.D. (which was about the average daily consumption) could be put through the main at a head of about 219 feet or 95.6 lbs. per sq. in. pressure. Of course there would be other losses getting from the pump to the main, but if this were accomplished reasonably well, the load appeared to fall within the efficient range of fire pumpers, which we had been advised was between 100 and 120 lbs. per sq. in. at their rated capacity. Now the question was, would they stand the continuous grind hour after hour for several or more days? We contacted a well known engine manufacturer's representative who, after studying the requirements, decided they would so far as his company's pumpers were concerned, and should for his competitors' equipment. We then, with the help of the fire chief, selected the two newest pumpers, one of 1000 g.p.m. capacity and the other 750 g.p.m., which combined should give about 2 m.g.d. at 80% of capacity; the reduced capacity being to keep wear and tear on such expensive equipment to a minimum.

The next problem was to provide some means of connecting the pumpers to the 16″ main. It had been decided to make use of a 6″ blow off which existed on the bank of the stream, its outlet being submerged in the creek, and we planned by cofferdamming to smash the blow off at the gate, tie the gate to the main, and use flanged 45's and a diagonal riser to bring the connection up some seven feet to above the surface of the ground (Fig. 1). Then came the question of a manifold to be assembled on the riser providing eight 2½″ connections for the pumper lines. After a heavy hour's session of engineers, firemen, and others, the only plumber present got his way and (Fig. 2) shows his brain child built by him in actual use on the job. He, as well as we, could improve upon it given unlimited facilities to work with, but it served its purpose well and is still preserved by us—just in case. A straight piece of 6″ pipe was threaded and fitted with a cap on one end and flange on the other to connect to the previously mentioned riser. Eight holes were burned in this pipe in staggered fashion

and 2½" pipe couplings welded at 90 degrees to receive the nipples and gate valves as shown. Female hose couplings were brazed to 2½" pipe nipples which were assembled on the valves. Telephone guy cables securely anchored the free end of the completed manifold. A pressure gauge was installed on the delivery end as an operating guide, and a half-inch connection was taken off to operate the solution-feed portable chlorinator (which is in the shanty to the right) and also to provide means of sampling the water. The hose at the top of the picture draped on the 2 x 4 is the chlorine solution feed and was simply jammed through the suction screen of one of the pumpers. This made it necessary always to start this pumper first and stop it last to insure chlorination of all water being pumped into the manifold. A residual of 0.75 to 1.0 ppm was maintained at all times and bacterial reduction was excellent.

Fig. 4, the schematic sketch of the hydraulic conditions, shows that a pressure of 85 lbs. must be developed to just match the static pressure from the water in the filter, and only above this pressure would the pumpers begin to deliver. It will also be seen that it requires a pressure of 95.6 lbs. to deliver 2 m.g.d. As a matter of fact, the manifold gauge had to be kept at about 98 lbs. to accomplish this because of friction loss in the make-up bends between the manifold and the main. The pressure gauges on the pumpers read about 110 lbs., the difference of 12 lbs. between this and the manifold gauge representing the friction loss in the hose and manifold assembly itself. It can therefore be stressed that all these friction losses should be carefully considered when planning to use emergency pumpers. The rather generous use of two lengths of hose between the pumpers and the manifold was necessitated by the selection of the most suitable places to drop the suction lines, but it certainly would be better if this could be arranged to use only single lengths for the hook up, providing no sharp bends resulted.

Actual pumping started only a few hours after our reserve failed. After completing all connections, men were stationed at the manifold valves and the order given to engage the pumps while the eight men opened the manifold valves to let the load down on the pumpers. The surge caused such alternate racing and laboring of the engines as I've never heard before and each time the manifold gauge reached the end of its swing my heart missed a beat. However, this violence gradually grew less and the gauge, after a minute or so (that seemed like an hour), settled down to a steady 95 lbs., from where we worked it up to 98 lbs. The pumpers ran continuously for the next three days except for a change of oil and servicing every eight hours. We never were able to get away from the starting surge, but we smoothed it out some with practice—either that or it no longer caused the fright experienced on the first occasion. The delivery during this period was a smooth 2 m.g.d. as expected, but it was necessary to hold the manifold pressure 3 lbs. higher than the calculated 95 lbs. per sq. in. to accomplish this.

The supply main feeding the depleted reservoir had been cleaned to raise its capacity from 1¼ to 2¼ m.g.d., this step being taken as a means to put us back on our own, as obviously we could not expect to pump indefinitely.

When the pumps were stopped and the flow from our newly cleaned main turned into the reservoir we found to our dismay that 6 miles of our 16" line from the reservoir toward the filter had filled with sediment on its last day's flow to such an extent that its capacity was cut to 1.1 m.g.d. Of course the remaining two miles from the pumping site to the filter was clear. We opened blow offs all day with a slight increase in flow each time, but at 10 o'clock that night we had the pumpers back on the job. However, this time we pumped the creek water into the main simultaneously with the gravity flow from the reservoir which resulted in a total flow to the filter of about 2.75 m.g.d., approximately 1.5 m.g.d. by gravity and 1.25 m.g.d. being added by the pumpers from the creek. This raised the hydraulic gradient (Fig. 4, condition No. 2) and the manifold pressure stayed very close to the computed 102.6 lbs. per sq. in.

After two days of this type of pumping the fouled supply main cleared and the system was again operating normally at about 2 m.g.d. by gravity.

More ill fortune dogged us in the way of abnormally high consumption in the city caused by frozen plumbing and a large main break, so, with the tricks we'd learned, back to the creek we went with one pumper, where, pumping under condition No. 2, we got about 2.5 m.g.d. into the filter for two more days until the consumption returned to normal.

Our slow sand filter handled the creek water very well and with post chlorination the bacteriological results were entirely satisfactory. The creek at the time was clear and this, plus the relatively low temperatures of early Winter, probably contributed to this result. As a matter of fact many people thought the creek water tasted better than our regular supply.

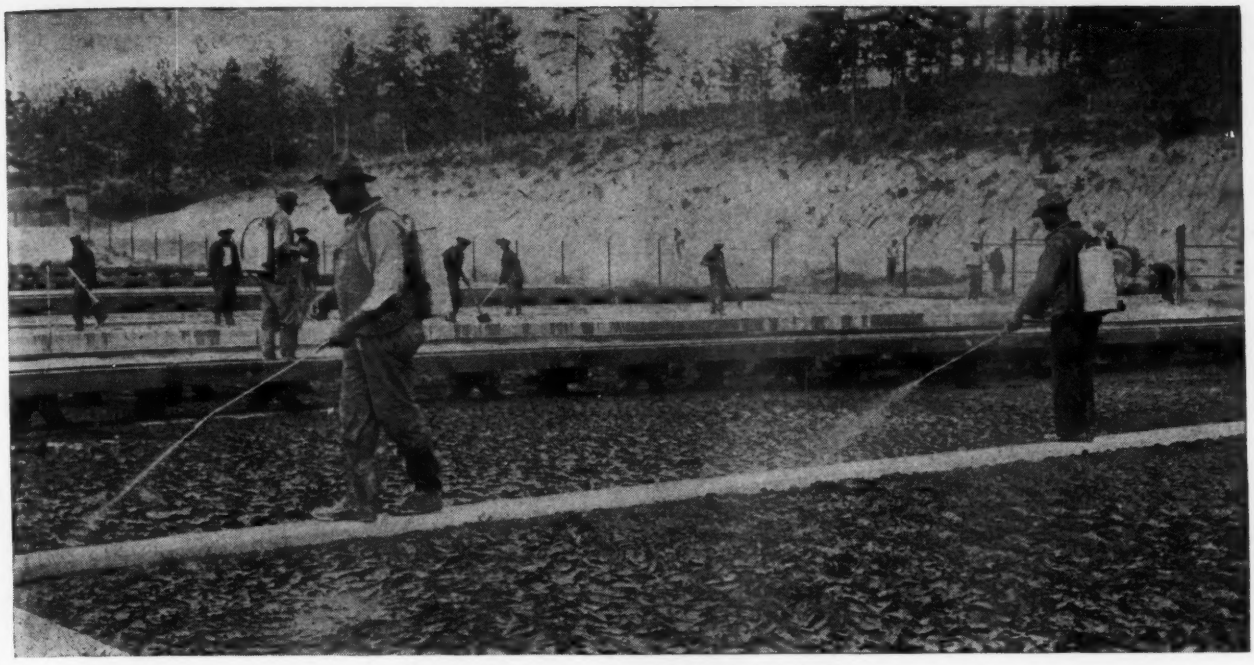
Now about the condition of the pumpers when we finished—well, they were completely overhauled and I don't think this cost ran over $500. They'll take it all right but it's strictly an emergency step and a last resort, and in hard freezing weather all sorts of difficulties are encountered. The success of such an undertaking depends upon careful study and planning, and one needs most of the breaks, lots of firemen and all of the assistance to be had as well.

May the reader never have to resort to this means of supply, it's nerve-racking but not nearly so bad as just watching a city run out of water, so if one has to—it can be done.

Fig. 3—General view of pumping plant at creek crossing.

Municipal Debt Continues to Drop

The net debt of United States cities has dropped for the fifth consecutive year, according to a survey by the Detroit Bureau of Governmental Research. The report estimated on the basis of 286 of the nation's largest cities that the total gross bonded debt of municipalities of more than 30,000 population was $8,700,000,000, or $171 per capita, on January 1, 1942. This total reflected a decrease of 4.6 per cent since the beginning of 1941 and a reduction of approximately 12.5 per cent in five years.



Spraying No. 2 Diesel oil on sludge drying beds.

Destruction of Housefly Larvae and Pupae in Sewage Sludge Beds*

By Herbert Spencer, Julius C. Hedden, and Leonard B. Dworsky, Lieutenant Colonel, and Captains, Sanitary Corps, Army of the United States

A pest of houseflies, breeding in the sludge beds at the sewage treatment plant of Camp Shelby, was eliminated by spraying the beds with No. 2 Diesel oil.

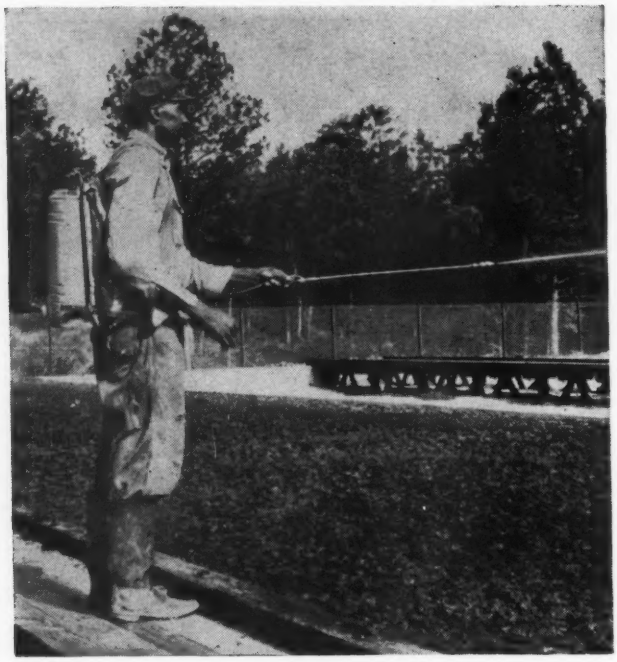
TOWARD the end of May, 1941, common houseflies (*Musca domestica* Fabr.) became numerous and troublesome in the Army reservation at Camp Shelby, Mississippi. Complaints from mess halls and the hospital began to come in, and requests for fly traps, fly paper and fly poisons multiplied. Several hundred fly traps were constructed and distributed, and fly spray was procured, but although many quarts of flies were caught and killed, countless thousands emerged to take their places.

A survey for breeding places indicated that these houseflies were coming from three sources: first, corrals and improvised stables in the middle of the camp in which a dozen riding horses were kept; second, from a piggery just west of the camp boundaries; and third, from the sludge drying beds of the sewage disposal plant.

Only a few of the flies were emerging from the stables and corrals, and practical elimination of breeding was obtained by collecting the manure more frequently and by spreading it thinly on grass land. The piggery to the west of the camp was privately owned by the civilian who had the contract to remove and dispose of the edible garbage from Camp Shelby. Fortunately, the garbage contract extended only to the end of the fiscal year, June 30, 1941, so in the invitations for bids for the new fiscal year a stipulation was added that all bidders agreed not to dump or feed garbage within eight miles of the military reservation. A short time after the new contract went into effect and the pigs were moved away, fly breeding ceased there also.

The sludge beds at the sewage plant were furnishing many times the numbers of flies produced by the two sources already described. The disposal plant consisted of primary settling tanks, activated sludge aeration tanks, cylindrical settling tanks, sludge digesters and sludge beds. There are six of these sludge beds, each 60 by 118 feet, the underdrains of which discharge into a creek. In new plants of this type it generally takes a number of weeks of operation to develop the bacteria to their maximum efficiency, and until this optimum operative condition is reached, digestion of the sewage may be incomplete. Apparently, this was the case at Camp Shelby, and as a result some of the sludge run out into the drying beds was in-

*The authors acknowledge indebtedness to Colonel Thomas L. Ferenbaugh, Medical Corps, The Camp Surgeon, Camp Shelby, for helpful suggestions and supervision in this experiment on control. This paper is published by permission of the Surgeon General, U. S. Army.



Equipment for spraying oil.

completely digested, and attracted flies which bred in enormous numbers. It did not dry out, as it was kept wet by rains and leakage of supernatant liquid from the digesters, and this prolonged the breeding of flies and prevented disposal of the dried sludge in the usual manner by hauling and spreading. When first examined, on June 6, 1941, there was from three to six inches of wet sludge in each of the beds, and the fly larvae were so numerous that the mass was actually "working" from their movements. Puparia ready to emerge were mounded up in the drier places, and especially in the shrinkage cracks between the sludge and concrete curbings. We were confronted with an active breeding area of 42,480 square feet of sludge! The quantity of puparia just ready to transform into adult flies, and the enormous numbers of nearly mature larvae gave warning that immediate control of all breeding in the beds was absolutely necessary.

A quick search through the few available reference books, for suggestion of chemical control methods, was not very productive. Borax, hellebore, iron sulfate, crude oil and waste crank case oil were mentioned* for control in manure piles, but the first three materials were unobtainable in large quantities in the vicinity on such short notice. Two insecticides were immediately available in the Camp. Paris green dust had been purchased for mosquito control, but was too expensive to use on the sludge, and from the natures of the pest and poison, seemed unpromising for control. Diesel oil (#2 fuel oil) was being used extensively in internal combustion engines and for mosquito control in Camp, and was cheap and available in large quantities. It had proved to be more toxic to mosquito larvae than crude oil cut with kerosene, or waste crank case oil. Since it was highly toxic to mosquito larvae in water, it was thought that it might have some toxicity to fly larvae in wet sludge. It was decided to attempt emergency control of fly-breeding in the sewage plant by spraying the sludge beds with this diesel oil.

Accordingly on June 6th the first application of #2 diesel oil was made. Knapsack sprayers were used for distribution, and 220 gallons were spread, covering with a thin film the entire sludge mass, with special care to use plenty of oil next to the concrete walls where pupae were so abundant. The effect on fly larvae was immediate; those in the upper layers of sludge worked their way to the surface, and into the oil film, crawled about for a few minutes, and became motionless. Next day they were oil soaked and dead. The pupae were heaved up in the cracks into large masses, by the writhings of the larvae underneath.

To determine the effect of the oil on the pupae, small masses of them were picked up here and there over the beds and were carried to the laboratory. There the empty shells were eliminated, and 1,000 unemerged pupae were counted out and lots of 100 were placed in each of 10 clean petri dishes, with a few drops of water for moisture, and were held for twelve days. Only six flies emerged from the 1,000 pupae, indicating a survival of less than one percent, after a single oiling.

A few larvae survived the first oiling in the deeper layers of the sludge, so additional sprayings were made on June 13th and June 20th. But by the middle of June flies had practically disappeared from the Camp. The second and third oilings were not entirely necessary, but were given as insurance against return of the nuisance. In all, 510 gallons were used on the beds, at a cost of $38.25 for insecticide.

Later on, diesel oil was spread similarly on another fly-infested sludge bed which had been used by the Camp while the sewage disposal plant was under construction. One thorough spraying eliminated the flies completely and also killed many large rat-tailed larvae of the privy fly, *Hermetia illucens L.*

The sludge beds were inspected each week after the last spraying and the observations indicated that the oil film did not retard drying of the sludge to any noticeable extent. As soon as the sludge was dry enough to move, it was shoveled into trucks and was spread rather thickly on some partly denuded grass land near the disposal plant. Soon it produced a luxurious growth of grass and clover. The #2 diesel oil is somewhat volatile, and the amount necessary for fly control was so small in relation to the quantity of sludge that it neither retarded the drying nor rendered the material unsuitable for use as fertilizer.

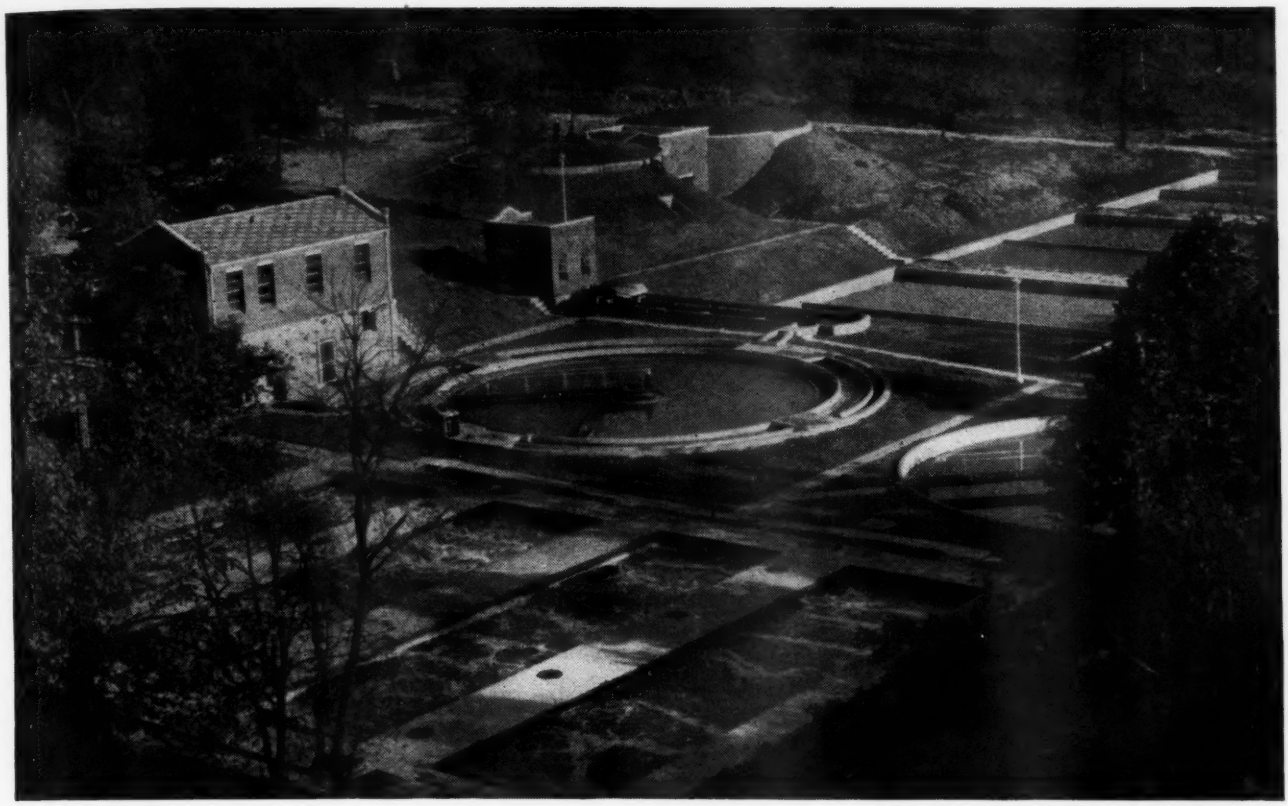
The results of this experiment suggest that #2 diesel oil might be useful for control of flies under other similar conditions, such as in infested horse-manure piles, or fly infested latrines. Ordinarily a single application would give relief from fly outbreaks from these sources, but the material is so cheap, and so easily applied, that weekly sprayings are recommended, as long as fly adults or fly larvae are present.

*Dunham, George C., 1931, Military Preventive Medicine—2nd Edition (Pages 692-694). Carlisle Barracks, Pa.

To Sewer Contractors—Don't Do This

A sewer trench was excavated with a trenching machine to a depth of 17 feet and was securely braced. A check of grades the following day indicated that an additional eight inches of excavation was required. Instead of using hand labor, cross bracing was removed from the trench and the machine was used. As bracing was being replaced the unsupported banks began to slide. The operator of the trenching machine was able to drop his bucket into the trench above the workmen, saving them from being entirely covered. The cost of the operation was substantially increased by an unsafe practice, and two men narrowly escaped death. It pays to do work safely.

From "Construction Safety"



The sewage treatment plant of Columbia, Mo.

A Study of Infiltration

By DEWEY WELCH
City Engineer, Columbia, Mo.

Roof water and infiltration through poor joints in a privately laid sewer was more than ten times the dry-weather flow. How infiltration points were located and repaired.

IN 1940, Columbia, Missouri, completed several major improvements to its sewer system. These included four pumping stations, many miles of new lines (both pressure and gravity) and a new Dorr activated sludge plant. Our present population is approximately 25,000, but although the plant was designed for a population of 35,000, it was soon apparent that infiltration made it necessary to bypass the plant after every rain of any consequence.

A study of flow charts at the plant showed a large amount of roof runoff. This was evident from the fact that during August, with ten days of no precipitation, there was a constant daily flow of 900,000 gallons, but after one-fourth inch of rainfall this flow jumped to 1,300,000 gallons. Of course, one-fourth inch of moisture would not run across the lawn, much less cause infiltration; hence downspouts seemed to be responsible.

A survey of downspouts followed, with careful consideration given to those buildings constructed prior to the rigid enforcement of the building and plumbing codes. Many of these downspouts were found to be connected to the sanitary sewer, and in several instances the surface run-off from the ground around the buildings also entered the sanitary sewer. A project is now under way to correct this condition.

In another section of the city, new homes were built and occupied. The owners immediately complained of flooded basements during rains. Investigation showed infiltration to such an extent that manholes in this vicinity overflowed like fountains. This overflow sewage was deposited in holes in the nearby creek where small children liked to wade and the Health Officer was anxious to have this situation corrected. The Engineering Department consulted all available maps, checked grades and pipe sizes. Plans and profile grades had been recorded for the trunk line sewer which was constructed by the city. The grades were constant and the pipe sizes on these grades were capable of carrying 3,000,000 gallons in 24 hours. The sewer district called for 800 tax bills. Figuring an average of four persons per tax bill and based on our consumption of 60 gallons per person, the water pumped to this district would be 192,000 gallons in 24 hours—a very small percentage of the line's capacity.

An estimate of $15,000 was made for relaying and

(Continued on page 22)

The State of the Public Works and Public Property of t oro

Excerpts from a Report to the Mayor and Council, by I. Russell Riker, Engineer and Director, Dept. of Engineering, in February, 1942

WITH the exception of matching or contributing our share of Federal, State and County aid to local projects, the Public Works Dept. during the emergency will limit its expenditures to maintenance and repairs. It is very necessary to keep our buildings, streets, and other public property in good condition, for if we do not do so, it will cost more to replace than it would have cost to repair. It is difficult to cut down such services as garbage collection and disposal, street sweeping, snow and ice removal, etc., for they are very essential, particularly for sanitation. There are practically no non-essential public works services in our municipality. We may, and are planning to, cut down on the extent of some of these services. The streets, for instance, may not be swept quite so often.

From our surplus funds of last year we purchased extra pumps, portable chlorinator, and other mechanical equipment, and installed many extra parts, so that we are in fairly good shape to cope with an emergency.

Placing top wearing course in old street.

Present Condition and Value

Our public works are in better condition now than ever before. Sixty percent of our road surfaces should last about ten years with very little maintenance. The estimated replacement cost of our roads, curbs, and sidewalks is $1,270,000. All roads reconstructed have been provided with curbs and gutters so as to permit cleaning with the mechanical sweeper. Our remaining roads have been resurfaced and a small amount of resurfacing and patching each year will maintain them. Some repair work is necessary to our curbs.

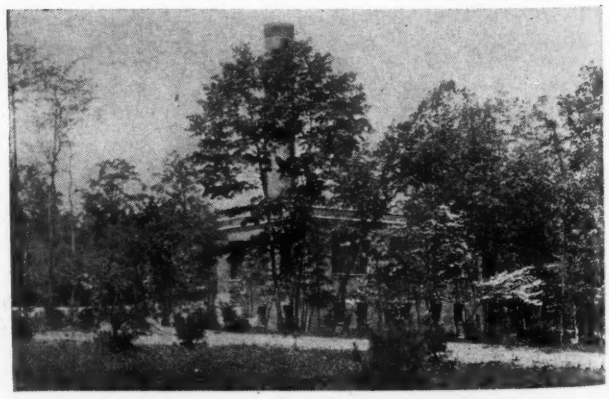
We have approximately 12.7 miles of storm drains and 300 catch basins. These catch basins require cleaning approximately four times a year. The replacement value of our storm drains and catch basins is $345,000.

Our Borough is 95% sewered with sanitary sewers, there being 21.1 miles of lateral sewers in the Borough, with trunk sewers amounting to 13.5 miles, and a sewage treatment plant serving the Borough, Township, and University. The value of the sewer system, including the treatment plant, is $1,135,000.

We have seven trucks ranging in capacity from a pick-up truck to 7 tons, and in age from 1934 to 1941. There is also a rebuilt road scraper; a rebuilt tandem roller; a 3-wheel roller; a compressor on an automobile chassis; three concrete mixers, two 1-bag, and one ½-bag; three portable pumps; one semi-portable pump; two tar wagons; two stone spreaders—one for spreading large stone and the other for small stone; two snow plows; one combination mechanical mower and snow plow; one mechanical sweeper; one tree sprayer on automobile chassis; a bulldozer; and small tools and equipment. All are in working condition except the bulldozer. The replacement value of this rolling stock is estimated to be $20,000.

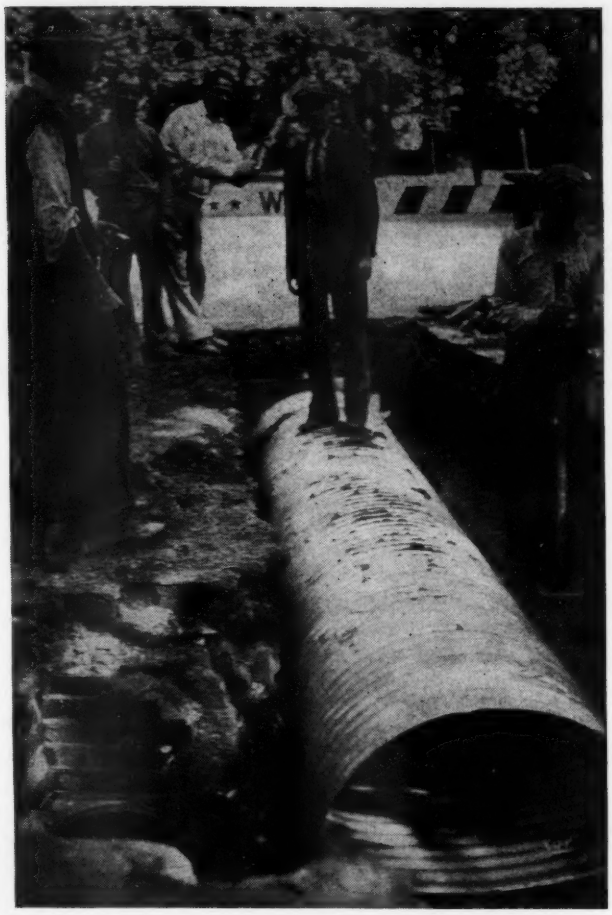
Improvements made in the sewage treatment plant since it was built have more than balanced depreciation. While it was designed for only ten years, the average flow now is only 75% of its capacity, due to extreme care taken in making new connections and to improvements made in the operation of the plant. For many years to come the only capital expenditures should be the replacement of certain machinery which naturally wears out. Aside from the fact that the furnaces at the incinerator need constant attention and repairs, the incinerator (particularly the building) is in excellent condition. The replacement value is $34,000.

Our public buildings, which consist of the borough hall and jail, two fire houses, borough garage and police garage, are in good condition, with the exception of the Chestnut Street fire house.



Incinerator partially concealed by foliage.

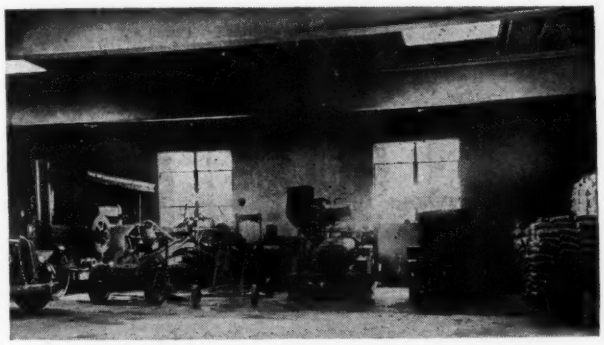
f t[b]orough of Princeton, N. J.



At right — Special sectional storm drain street crossing.

Improvements During the Last Ten Years

The good condition of our utilities and buildings is due principally to our capital improvement program started in 1931, when we built a new trunk sewer system and treatment plant fully financed by the Borough. The annual cost to the Borough for operation and carrying charges for the sewage treatment plant and trunk lines has been reduced from $59,985 in 1933 to $36,785 in 1942, or a saving of $23,200 each year.



Interior of garage, showing borough equipment.

A list of the improvements made during 1934 to 1941, includes:

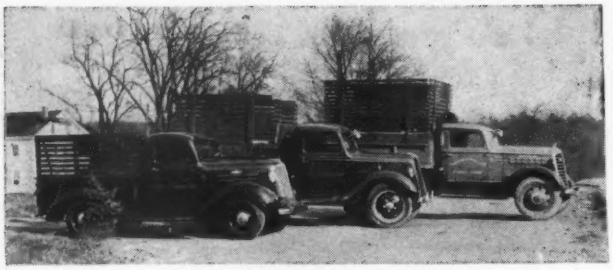
1. Streets replaced or rebuilt, 8.3 miles.
2. Concrete curbs, new and replaced, 6.6 miles.
3. Bluestone curbs, new and replaced, 4.4 miles.
4. Sidewalks, new and replaced, 5.4 miles.
5. Storm drains, 5 miles.
6. Sanitary sewers, 3.1 miles.
7. Catch basins and other concrete structures, 161.
8. New buildings: Incinerator, community house, borough garage and police garage.
9. Repairs and alterations to existing buildings: New roofs, 100,000 sq. ft.; painting, 397,000 sq. ft.; patching, 2,000 sq. yds.; and miscellaneous carpentry, plumbing, and steamfitting.
10. Demolition of old structures: Northwest sewage treatment plant, Northeast sewage treatment plant, old incinerator, old borough garage and four small garages and a barn.
11. Sewage Treatment Plant: Tool house, five garages, 2 chemical houses, chlorine room and platform, settling tank, chemical mixing tank, miscellaneous additions, storage yard, roads, drains, etc., and brush burner.
12. Rifle and revolver range.

Many other miscellaneous items have been built throughout the town, including 4,400 lin. ft. of cobble gutters covered, laying water mains, concrete floors, cinder walks, grading and seeding, monumenting street corners, drawing plans for permanent records for all our utilities, and planting 12,400 trees and seedlings.

Plans for Future Improvements

When the Mayor and Council appointed the Engineer coordinator for the Public Works Reserve last fall, it was difficult to anticipate just what our future needs in the way of public works would consist of. Our regular utilities had been altered and added to for the past ten years until they were nearly complete. The Public Works Reserve has been established by the Federal government under the National Resources Planning Board to encourage and assist municipalities in the field of public services and capital improvement, to promote long range planning of useful public services, to aid and encourage governmental bodies in wisely programing for a period of years, to encourage the advanced preparation of designs, plans and specifications for such public improvements so as to establish on a national scope a known reserve of useful public works.

The Princeton Planning Board has been designated the official board for investigating future projects. The Board met on Saturday, February 14th, 1942, and authorized the submission of certain public works projects. A firehouse for the No. 1 Company on Chestnut Street stands at the head of the list, a future Community House for the white population of Princeton is next. New and parallel connecting streets for which we have secured the right-of-way, and others without the right-of-way, were approved. The completion of our permanent paving state program was also approved. Additional utilities such as storm drains and sewers were listed. We were asked to look into the possibility and practicability of the following: Comfort station for the business section, swimming pool or pools; studies of certain traffic hazards with corrective measures; playgrounds and other recreational facilities, including possible parks and public parking places.



Trucks with racks for collecting leaves.

The listing of these with the Federal government does not obligate the municipality but gives the government some idea of how much public work might be available in our municipality in case we were again forced to public works construction as a means of work relief.

A Study of Infiltration

(Continued from page 19)

sealing the entire system of more than three miles. As stated above, the city had constructed the main trunk line, to which was connected a lateral built by a private development company. Inspection during rains showed both lines carrying an enormous amount of storm water. Every foot of the system was walked over during and after rains. The lines built by the development company were not easily traced since no record of their location was available. By following up the draw in the neighborhood of their location, it was observed that the bed of the stream dried up soon after it ceased raining. Investigation showed that the sanitary sewer followed the draw about two feet below the elevation of the stream. The joints had very little mortar in them and the cover material was composed of leaves, sticks and humus matter, since the ravine was wooded. In short, the inspectors revealed the following conditions:

Privately Built Line:

Three 8-inch y's open and draining considerable acreage.
Approximately 500 feet of line in wooded draw with open joints.
Approximately 300 feet of old abandoned line still connected to trunk line (between manholes) and used as subdrainage system for vacant lots.

City Constructed Trunk Line:

Two 8-inch lamp holes with their tops below high water and caps missing.
Twelve creek crossings with the line exposed therein and many of the joints open.

Corrections are being applied through the process of elimination. Checks are made at each manhole at the time of rains. When a location shows an excess in flow and the next location above is normal we then look for a break between the two. Sometimes fluorescein Merck is added to holes in either a lawn or creek bed, and if the color shows up in the sewer line, we then dig to locate the break. Considerable labor is saved by this method. Suspicious downspouts are checked the same way.

Before starting any work the line was rodded to see if roots could be stopping the flow. Some roots were found, but an obliging rain showed that other work was required. To date we have spent approximately $800 eliminating the trouble spots listed above, and an inspection shows the lines flowing at one-half their capacity during a rain which early this spring would have overloaded them.

Salvaging 2,000 Tons of Street Car Rails

(Continued from page 13)

pleted, at which time the area will be prepared for the final double sealing operation. It may be necessary, before sealing, to go over sections of the trenches where compaction was uneven with a light wedge course if any noticeable rutting by traffic has occurred.

The double seal coat as planned for the job will cover at least the 17-foot car track section and may in some places extend from curb to curb. It will consist of the application of 0.40 gallon of tar and the spreading on it of 25 pounds of stone chips or fine slag to the square yard. The first coat will be rolled before the application of the second seal coat, which will consist of 0.30 gallon of tar and 20 pounds of stone chips or slag to the square yard. All quantities may be varied as desired. A final rolling will complete the seal work. Traffic will be permitted on the work between coats and immediately after the second seal. Experience has shown that an application of stone dust treated with calcium chloride applied over the second seal will tend to keep the surface moist and hold the fine stone in place while traffic irons it into the surface, and also prevent troublesome bleeding.

We have completed about forty per cent of the job and feel confident that the restored pavement will be equally as good as it was before, and with a newly maintained surface.

Appreciation is expressed to R. W. Roberts, representing the Barrett Company, for his assistance in working out satisfactory paving mixes. Credit is also given to the Work Projects Administration for the workmanlike manner in which the job is being carried on.

Mississippi Highway Dept. Conserves Tires

The Mississippi State Highway Department is setting examples for the public in the conservation of rubber and automotive equipment. Through its seven district engineers in direct charge of maintenance and operation of equipment, the following measures are being taken to conserve rubber:

1. Close and careful periodic checks on inflation of tires.
2. Changing of tires from front to rear at stated mileages.
3. Reduction of maximum loads on tires to 20 per cent below rated capacity.
4. Immediate repair of cuts, bruises, etc.
5. Pooling transportation of employees.
6. Combing all junkpiles for discarded rubber of all kinds to sell as junk.

Measures taken to conserve equipment:

1. Providing proper storage facilities for seasonal equipment, such as bituminous-surfacing equipment and mowers.
2. Preventive maintenance to catch defects before they become serious.
3. Reduction of truck speeds to a maximum of 30 m.p.h.
4. Reduction of loads.
5. Keeping all equipment thoroughly painted.
6. Maximum use of freight instead of long hauls with department equipment.

Minnesota's Ice Control System

As described by H. C. JAHNKE
District Maintenance Engr.

The highly systemized plan of ice control of District No. 4 of the State Highway Department. Heavily traveled highways are skidproofed throughout. Treated abrasives are stockpiled during the fall.

LAST year, Minnesota experienced one of the mildest winter seasons on record. Snow and ice-fighting equipment lay around nearly all winter and did hardly more than collect dust. That's the way the weather happened to turn out, but the State Highway Department doesn't set up its systems for freak conditions. It was prepared, as usual, for the tough months of heavy snows and treacherous ice which this northern state normally encounters.

Minnesota has a smoothly operating and effective ice control system. Perhaps this is partly because this state is so often subjected to winter's blitz, but a great share of the credit should also be given to the diligence and progressiveness of those who direct the program.

To find out what makes this state's system function, the writer recently called at the highway department's main office in St. Paul and talked, or rather listened, to C. L. Motl, Chief Maintenance Engineer. After relating the winter maintenance policy in general and describing the state-wide organization of the program, Mr. Motl suggested, "But why don't you drop in at one of the district offices, and talk to one of the men on the firing line. His experiences should give you a pretty good over-all picture of our ice control operations." So we visited Brainerd and interviewed H. C. Jahnke, the District Maintenance Engineer.

District No. 4 was among the first of Minnesota's sixteen districts to adopt a highly systematized plan of ice control. Impressed with the fact that more accidents occurred during periods of ice and sleet than during snow storms, the district decided that the situation called for action. For a number of years it had been the practice to skidproof curves, intersections and other particularly dangerous locations, but the accident record showed that this was not enough, since many accidents still occurred on untreated straightaways, even though motorists drove at reasonable speeds after passing skidproofed curves and crossings. Therefore full-length treatment of heavily traveled highways was inaugurated and substantial refinements were also made in the operating plan.

Spreading calcium chloride-treated abrasives.

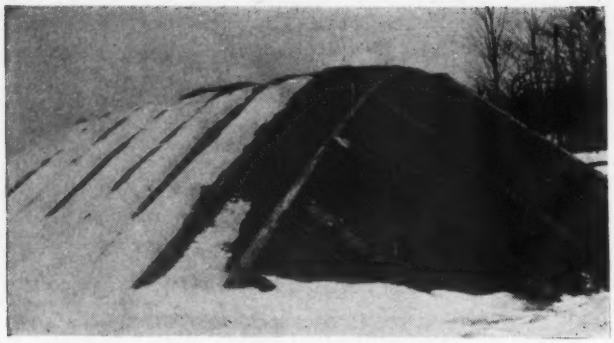
Spreader attached to rear of truck.

During late summer and early fall, some 6000 cubic yards of coarse sand are placed in strategically located stockpiles throughout the district. Specifications call for material with a top size of ½ inch and a minimum of fines. Uniformity of size is also considered desirable.

Each stockpile contains from 100 to 300 cubic yards of abrasives, depending upon the amount of territory it is designed to serve—enough to last through several storms without the necessity of constant replacement. At the central garage a 500-yard stock is maintained, since the equipment radiating from there serves sections of five highways.

As the sand is loaded into trucks for delivery to the stockpile locations, it is treated with calcium chloride at a rate of 75 lbs. per cubic yard. For full effectiveness, it is very important that this freeze-proofing agent be uniformly distributed and mixed with the sand. Proper incorporation is most easily accomplished by feeding the calcium chloride through a hopper located directly over the conveyor belt which deposits the abrasives into the trucks at the time that stockpiles are being prepared.

In addition to preventing the stockpiles from freezing, the calcium chloride treatment imparts an ice-melting property to the abrasives which serves to



Stockpile of treated abrasives covered with waterproof paper.

anchor them securely when applied to slippery pavements. When temperatures are very low, however, and traffic conditions demand immediate embedment of the grits, an additional light treatment with calcium chloride is made at a rate of 15 to 30 lbs. per cubic yard. This re-treatment enables the abrasives to dig into the ice more rapidly at low temperatures.

Rain and snow are very likely to wash out or dilute the calcium chloride in the outside portions of exposed stockpiles, permitting the formation of a frozen crust and a loss in the quantity of usable material. Consequently it is the practice in District 4, and in the other highway department districts, to provide further protection by covering the stockpiles with waterproof paper or by a light bituminous treatment. The construction of bins for storage of abrasives is also being tried out.

Skidproofing of icy surfaces is always an emergency operation and the effectiveness of any control system is keynoted by the speed with which it gets into action. When roads are blocked by snow, traffic necessarily comes to a stop and suffers only delay and inconvenience. But, when roads are icy, traffic does not stop, so the danger to life and property exists up to the moment protection is provided. To overcome this danger, and do it fast, a precise coordination of all facilities is required.

District No. 4 has divided its winter maintenance organization into self-contained units (or call them task forces), operating from the central garage and 23 sub-stations. Each unit is provided with sufficient equipment (trucks, mechanical spreaders, motor bladers) and manpower to skidproof and remove ice formations in a specific sector of the highway system. Stockpiles of treated abrasives are situated in the most advantageous locations for rapid loading and spreading.

The mileages allocated to each patrol unit are based on traffic densities, as are the operating schedules within each sector. Thus, in areas where traffic is generally high on nearly all routes, the ice control crews are responsible for a lesser mileage of roads than is the case in areas where traffic variations permit ice control measures to proceed on a priority basis.

Men who comprise the ice control crews are on 24-hour call and the section foremen also have authority to engage extra labor when needed. A constant day-and-night check on weather and road conditions is maintained in each section, and the observations of highway department personnel are augmented by reports from the state highway police, truck drivers, and filling stations.

General supervision of the system is performed by the district maintenance engineer, and the status of each unit's activities is known to him at all times. When severe ice conditions exist in restricted areas, crews from adjoining sections are quickly dispatched to the scene of action.

With preparations fully made and the organization plan established, the highway department is ready—come what may. Let's take a hypothetical, but typical, case and follow it through to conclusion.

The temperature had been on the down grade ever since seven that evening at sub-station 17 of Minnesota District 4. The section foreman had felt it coming and had already notified several of his key men to be ready for trouble. At 11:15 it arrived—with the ring of the phone and a voice, "This is Les Anderson, driver for Apex Motor Freight. Just came over Route 27 from Long Prairie to Little Falls and it's starting to ice up bad. Last 5 miles were really dangerous."

Not much more than a half-hour later, the first truck pulled away from sub-station 17, and was followed shortly by the other crews. Arrived at a nearby stockpile, loading of the freezeproofed grits was accomplished quickly and spreading began. The self-powered mechanical spreader applied the abrasives at a uniform rate to a 16-foot width down the center of the pavement.

Reloading from roadside stockpiles when necessary, the truck crew proceeded over its designated route, using approximately 2½ cubic yards of abrasive per mile. (When ice conditions are extremely serious, two or three loaded trucks often accompany each spreading unit to avoid any delay for reloading. The spreader can be switched from an empty to a loaded truck in a matter of seconds.) After completing the full-length coverage of its allotted mileage, the spreading unit returned over the same route and re-treated the curves, intersections and other points of particular hazard. Within a maximum of five hours, all primary paved highways on the system were well protected—some 450 miles of high-type roads in District 4.

Skidproofing is done, but the work of the ice control crew is not yet finished. As soon as practicable, the entire ice formation—which has been softened and sometimes completely broken up by the calcium chloride-treated abrasives—is bladed off the surface to provide bare, dry pavement. When subsequent sleet storms produce a second layer of ice, before time has permitted removal of the first coating, the department has found that calcium chloride-treated grits again prove their value, by maintaining a definite plane of separation between the skidproofed surface and the new ice formation. This makes eventual removal of the ice much easier than where a solid, thick layer is allowed to build up.

After the highly systematized ice control plan, with full-length protection, had been in operation for a reasonable period, inquiries were made of a number of merchants, filling stations and roadside stands in District 4. Almost all of them reported a marked increase in business since safer highway conditions had been provided. "And believe me," adds H. C. Jahnke, "our winter headaches are less frequent."

Stockpile of treated abrasives sealed with a light bituminous treatment.

Steps in repairing concrete pavements. Top, left to right: Cutting the hole, the hole, and tamping. Below, smoothing, testing, and crack pouring.

Street Maintenance Practices

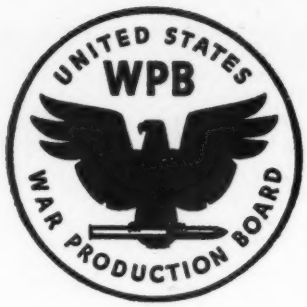
III—Patching Cement Concrete Pavements

Methods employed in cities of all sizes and in all parts of the country; selected as representative of some six hundred replies to a questionnaire on the subject.

IN THIS article are reported, with some repetition and occasional comments, the practices of various cities in patching cement concrete pavements. As in the other articles in this series, examples will be given covering methods used in all parts of the country and in small as well as large cities. The data presented are selected from replies sent in by some six hundred cities.

Arkansas.—Several cities report no cement concrete pavement. H. S. Peck, Commissioner No. 2, Fort Smith, breaks back edges to have them clean and uses high early strength (quick setting) cement to make the patch, which is guarded and lighted for one day before opening to traffic. John P. Morrow, Jr., acting city engineer, Batesville, sometimes uses H-E-S (high early strength) cement for patching holes in bituminous surfaces.

California, 45 cities reporting; a number of these cities have no concrete; at least 10 use H-E-S cement for patching. Clayton W. Paige, city engineer, Alhambra, squares and cleans up edges, moistens the old concrete and patches with concrete as good as or a little better than the original, to slightly above existing grade, and finishes off to the same texture. Archer B. Stuart, city engineer, Healdsburg, says: "Dig out, remove broken subgrade, fill with lean concrete (dry and well-tamped) and repair with an 8-sack or H-E-S 6-sack mix; then spray with calcium chloride." O. A. Gierlich, city engineer, Manhattan Beach, excavates 3 ins. below the base and 4 ins. beneath the affected area, roughens the edges of the patch, applies a cement wash and hand-tamps the new concrete back under the edges of the old. E. O. Imus, city engineer, Oxnard, tamps into the hole a dry-mix concrete, in 1-in. or 2-in. layers, until it is hard; then paints with an asphalt curing compound. L. Harold Anderson, city engineer, Palo Alto, uses 7-sack regular or 6-sack H-E-S mixture and usually makes the patch an inch thicker than the existing pavement. Frank E. Alderman, city engineer, South Gate, trims the edges and places the concrete patch material as dry as possible; tamps and floats this off; then lets it stand for about ½ hr. or until initial set and shrinkage have taken place; then re-



An Emergency Statement

to Industrial Executives

Manufacturers—large and small—have a special opportunity to aid the war effort—over and beyond the contribution they are already making.

That opportunity is Salvage.

No matter how much scrap is dug out of the attics and basements of homes, the fence corners and gullies of farms, war production factories will still fall far short of the scrap material needed unless the manufacturers of America get 100 per cent behind the program.

Six million additional tons of scrap iron and steel alone, as well as vast quantities of rubber and other materials, are urgently required to bring our war program to full strength.

Whether you are a lace curtain manufacturer or a maker of drop forgings the obligation is the same.

The job is more than simply collecting scrap material around the plant, or turning in the scrap which is created on the premises. It is a job of condemning obsolete machinery, clearing out unusable stocks, obsolete tools, dies, drills, fixtures, etc.

All unusable material, equipment, and stocks should be scrapped at once and put back into war production.

The philosophy of "It may come in handy some day" must give way to the doctrine of "My country needs it now."

When you need special information—consult the *classified* READER'S SERVICE DEPT., pages 47-49

Patriotic volunteer committees of executives are already hard at work on this problem in 421 industrial centers.

The Industrial Section of the Conservation Division has a corps of technical advisers who are prepared to work with all types of industries.

A thoroughgoing Salvage program in a factory can not only help meet the present emergency, but can help prepare that factory for its postwar operations through the elimination of once wasteful practices.

1 The first thing to do is to put some one individual in charge of Salvage in all departments of your business and give him not only the responsibility to act, but the authority to act.

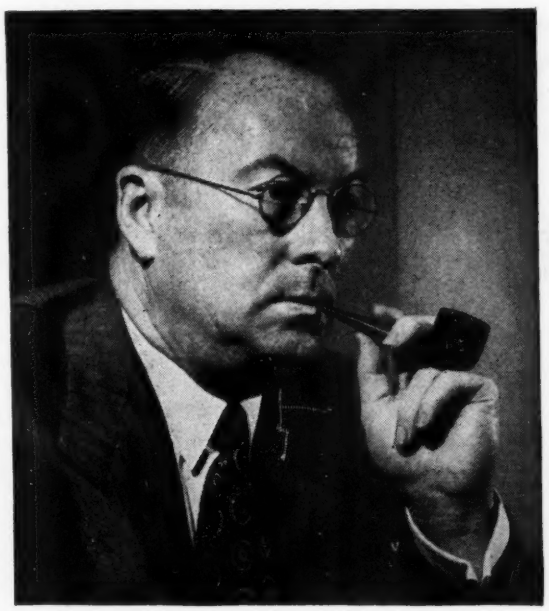
2 The next thing to do is to get in touch with your local Industrial Salvage Committee and map out a detailed program with the materials and ideas that are available. Their program contains 17 simple steps.

If in any doubt, write or wire at once to the Conservation Division, War Production Board, Railroad Retirement Building, Washington, D. C.

This job is being tackled by a democratic nation through the volunteer efforts and initiative of democratically managed industrial concerns, rather than through directives or compulsion as it is done in Axis countries.

Every executive, every superintendent, every foreman and every worker in every plant can help.

The main thing is to get started now.



All unusable material, equipment, and stocks should be scrapped at once and put back into war production. Please read this message and act **now.**

D. M. NELSON, CHAIRMAN, WAR PRODUCTION BOARD

This message approved by Conservation Division

WAR PRODUCTION BOARD

This advertisement paid for by the American Industries Salvage Committee (representing and with funds provided by a group of leading industrial concerns).

SCRAP FROM HOMES AND FARMS—As individuals, search your home from attic to basement. Search your garage. Look at the old familiar things in a new light. Do you need them—or can you get along without them? Your country needs every pound of scrap iron and steel, other metals, rubber, rags and burlap to provide the fighting materials our armed forces must have. Take your scrap to the nearest Salvage Depot—give it to a charity—or sell it to a Junk dealer. . . . If you live on a farm, consult your County War Board or your farm implement dealer. In any case, your scrap will flow back into the blood stream of our war production.

tamps and finishes. A number of cities use premixed bituminous material for patching concrete.

Colorado.—In Fort Collins, Burgis G. Coy, city engineer, says: "If the hole is large, we make it a little deeper than the original pavement and place some reinforcement in the bottom; then we fill with a good grade of concrete, tamp it well and strike it off to the pavement level; then we cover it with dirt, keep it wet for a few days and keep traffic off for about a week.

Connecticut.—Torrington, William F. Nierintz, city engineer: If the patch exceeds 1 sq. yd., we cut out the failed area and replace with concrete; if worn at the joints, causing a depression, we use premixed asphalt with screenings as a base.

Florida.—L. L. Lee, city manager, Miami, states that small holes are filled with rock asphalt and all other failures by slab replacement.

Illinois.—The practice used in repairing utility cuts in Danville is described by Lowell D. Kerby as follows: The excavation is backfilled with pit-run gravel; a ledge is cut under the adjoining pavement; ¾-in. round bars on 8-inch centers are inserted and concrete patching material placed. Rock asphalt or Warrentite is used to repair worn or ragged edges or flaking surfaces.

Indiana.—John T. Fritz, city engineer, Linton, when the break is bad removes at least 10 sq. ft. of surface and patches this area.

Iowa.—Geo. H. Gilbert, city engineer, Clear Lake, brushes the face of the cut area with a wire brush, cleans with water, applies a 1:2 portland cement mortar, and repaves with 1:2:3½ concrete, using ⅝-inch stone.

Kansas.—In Abilene, Walter F. Johnson, city manager, cuts out the weakened area, thoroughly compacts the subgrade, pours 6 ins. of concrete, placing a layer of 49-lb. mesh and laying a 2-inch top layer. H. E. McMillen, city engineer, El Dorado, cuts out a patch 12 ins. around the damaged area, tamps the subgrade with an air tool and pours 4500-lb. concrete.

Maine.—R. H. Glover, city engineer, Bangor, cuts the hole square, undercuts the firm slab for at least 4 ins. bearing on original soil all around, bends reinforcing back over the hole and patches with a fairly dry mix.

Massachusetts.—Springfield, Cornelius W. Phillips, superintendent, follows this procedure for surface patches: Paint with emulsion and fill with hot mix. Deep patches are filled with H-E-S concrete. J. Carroll Boynton, Highway Commissioner, Whitman, cuts out the concrete in the shape of a frustum of a pyramid, then paints with neat cement and fills with concrete.

Michigan.—Jackson, John M. Biery, city engineer, trims back cut to leave edge on a firm foundation, tapering the hole slightly to make it larger at the bottom, and patches. Arthur J. Jennings, city director, Monroe, allows the patch to attain initial set before striking it off.

Minnesota.—R. T. Campbell, city engineer, Brainerd, uses a bituminous patch when the depth of the damaged area is less than half the depth of the pavement. O. C. Helseth, city engineer, Crookston, bevels the edges of the hole 60°. The concrete patch is not placed until about a month after the earth beneath has been temporarily filled and packed. Frank O. Jones, city engineer, Fairmont, undercuts the failed area about 8 ins. and splices reinforcing steel in the opening.

Missouri.—Everett C. Meyers, city engineer, Maplewood, uses the following procedure: Cut out broken places; undercut edge of hole to thicken patch; fill with ready-mix concrete made with high early strength (quick-set) cement; finish. Richard W. Halteman, city engineer, St. Charles, uses a dry but workable mix, floated to grade.

New Jersey.—Fair Lawn Borough, F. E. Harley, borough engineer, "squares up sides of hole, cleans reinforcing, undercuts pavement 6 ins. so that the area at the base is 12 ins. greater and 6 ins. deeper than the pavement, and patches with H-E-S concrete." Charles B. Hausser, borough engineer, Madison, uses bituminous concrete for patching. John L. Miller, borough engineer, Roselle, uses ⅜-in. reinforcing and makes the patch 2 ins. thicker than the pavement.

New York.—The Borough of Brooklyn, Arthur J. Griffen, chief engineer, patches wholly with asphalt mixture. Harry S. Andrews, city engineer, Fulton, cuts side walls vertical, trims with a chisel, uses a rich mix with reinforcing, brooms surface and tools edges to make a good patch. John Joyce, city engineer, Johnstown, places mesh reinforcement 2 ins. below the surface. George R. Smith, village engineer, Pleasantville, cuts 3 ft. either side of the hole, making an opening of not less than 10 ft.; overlaps bars by at least 2 ft.; and uses H-E-S concrete. Ravena, Edwin C. Shatz, superintendent, uses the same methods and materials as for bituminous streets.

North Dakota.—Lloyd G. Wilhelm, city engineer, Minot, utilizes a vibrator, tying reinforcement and using a 1:2:3 mix.

Ohio.—Arthur Smalley, city engineer of Hamilton, cuts the patch so the sides slant in, leaves the sides rough, rams the earth base thoroughly and patches with a dry 1:2:3 mix. E. A. Fisher, city engineer, Lakewood, follows the same general practice, but tamps three times at 15-minute intervals. James K. McGinnis, city engineer, Steubenville, undercuts 9 to 18 ins. each way and then places his patch.

Pennsylvania.—Lowell W. Monroe, manager, Ellwood City, excavates to 6 ins. below the pavement and for 1 ft. around the hole, tamps base of hole thoroughly, places ½-in. reinforcing bars on 6-in. centers, trims edges of opening to a reasonably smooth surface and places concrete patch. Charles H. Wentzell, city engineer, Greensburg, uses "Stone Hard" for patching. J. Monroe Peters, assistant city engineer, Harrisburg, maintains the same color and texture as in the original pavement. Carl W. Fuehrer, borough manager, Milton, uses a stiff concrete with calcium chloride and finishes 1/16 in. high to allow for settlement.

Wisconsin.—Charles J. Popelka, city engineer, Beloit, uses a Mud Jack for sunken slabs. Rollin Abbott, city clerk, Hartford, reports the use of H-E-S concrete for patching.

Wyoming.—Rawlins, E. F. Sullivan, city engineer, makes no patch less than one sq. yd., removing sufficient material to make a patch of at least this size.

Sale of Mansfield, Ohio, Sludge

At Mansfield, Ohio, population 42,000, sludge from the secondary digester is run onto drying beds having an area of 1.9 sq. ft. per capita, where it remains for an average of about 10 weeks. It is removed by a caterpillar tractor equipped with saddlebags into which two men fork the sludge, which is deposited on a storage pipe. All the sludge is sold for fertilizer, most of it at 50¢ per cubic yard. So far the demand has exceeded the supply.

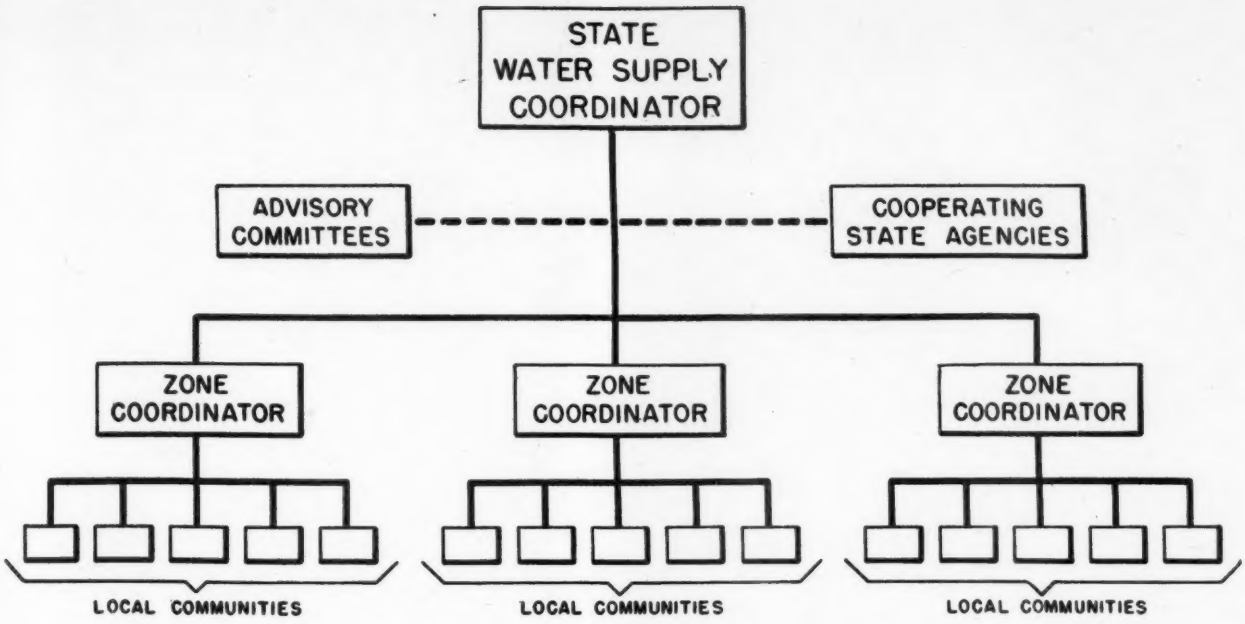


Fig. 1—Organization Chart, Emergency Water Supply Assistance Mutual Aid Plan

Maintenance of Water Supplies Under War Conditions

The Sanitary Engineering Section, Office of Civilian Defense, has issued a bulletin which outlines a cooperative plan of mutual aid for waterworks, to the end that "every important public waterworks shall be prepared to maintain service under adverse circumstances and to render prompt aid to neighboring communities in case of necessity." The following is an abstract of the main features of the bulletin.

IT IS recommended that water supply, public health, fire and other public officials concerned develop joint programs of emergency planning. Such programs must recognize the requirements imposed by local and state laws and the functions conferred by law on state and local boards and other agencies. Programs already in operation may not need to be changed to conform to the recommendations of the bulletin unless to render them more effective; but a uniform plan of organization facilitates cooperation among various units.

Legal aspects to be considered include: Wages, salaries, and workmen's compensation for emergency work, and civil service regulations; financial responsibility for loaned material used or destroyed; liability for results of negligence of loaned employees; power to make contracts or to merge authority and responsibility with those of other communities to achieve concerted effort; regulations governing privately owned public utilities; power of local communities to sell water when there is no surplus; franchise rights and considerations. Legislation to remove legal obstacles "for the duration", if needed, should be drafted and immediate consideration urged.

State Organization

The state is the logical unit for the organization of an emergency water coordination plan. Experience has demonstrated that a community alone cannot cope with a great emergency. It is desirable to treat an entire metropolitan district as a unit; where this crosses state lines, effort should be made to obtain cooperation of state agencies and utility companies.

Physical connections between municipal water systems, cross-connections, and development of new and auxiliary sources of supply are of definite concern to state health departments, which will continue their control over such projects in their respective states.

A *"water coordinator"* should be selected for an entire state; preferably a member of the state department of health or whatever state agency has supervision over municipal water supplies, since he is familiar with all the public water supplies and acquainted with local officials. He should at once establish working relations with the State Council of Defense and coordinate his program closely with other civilian defense activities. He must devise plans, complete an organization for carrying them into effect, and act in an advisory

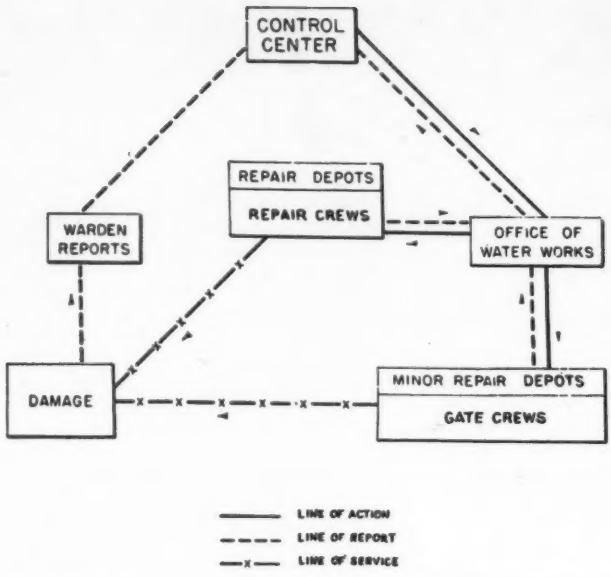


Fig. 2—Path of communication in rendering emergency water service.

capacity and supply the necessary leadership to maintain the program as a going concern.

To lighten the work of the state coordinator and facilitate execution of the program, decentralization in the administration of the mutual-aid plan should be obtained by dividing the state into water zones or districts, preferably coterminous with existing administrative divisions, such as those established for public health administration.

The state water coordinator's chief concern should be to inform zone coordinators or local officials of matters of general policy, and act in a liaison capacity between them and the state agencies; represent the state in matters pertaining to water supply as related to civilian defense; maintain general direction and coordination activities among the zones, and assist zone and local officials on special problems.

Zone Water Coordinators

It is recommended that these be selected from leading waterworks officials or health department engineers residing in the zone. They should be charged with the responsibility of organizing the zone and developing the mutual aid plan; should maintain contact with district defense councils and coordinate the water supply program with other civilian defense activities; assist local water works in preparing emergency plans for cooperation with fire and health departments and local defense councils and with each other; assist in obtaining materials and funds to execute plans approved by the state coordinator; keep the state coordinator informed as to the status of operation in his zone, and the local officials as to state and federal recommendations and policies; organize committees to make special surveys and studies; and generally supply the necessary leadership to carry out the program.

Use should be made of all constructive plans that are already under way.

Development of the Plan Within the Zone

Information necessary to organization of the zone is obtained by surveys of (1) auxiliary sources of water supply (with a view to connections between municipal supplies, using new or auxiliary non-potable sources, and drawing upon private, institutional and industrial supplies). (2) Inventory of materials, equipment and personnel of water works and contractors; of all supplies of chlorine and of chlorinators in the area; and of water, milk and oil trucks and street flushers that could be used for distributing potable water. (3) Air raid protection measures. The following are suggested:

(a) Expanding repair organization through recruitment and training of regular or volunteer personnel.

(b) Determination of assembly points and methods of assembling emergency repair and gate crews.

(c) Scattered stores of repair parts and trucks to serve as operating bases for emergency repair squads in municipalities, including storage of materials and equipment at strategic points for use within the zone.

(d) Availability of additional sources of power supply.

(e) Availability of emergency chlorination equipment for sterilization of contaminated water mains or water supply in event of necessity of pumping from auxiliary source directly to distribution system.

(f) Provision of temporary repair parts such as mechanical joints, flexible tubing, fire hose, sleeves, special adaptors, steel pipe, etc., for restoration of service.

(g) Provision of static water supplies for fire fighting in built-up sections.

(h) Adequate information as to location of valves, and painting of hydrants so that they may be seen during blackout.

(i) Availability of emergency transport for carting water to area in which service has been disrupted and cannot immediately be restored.

(j) Rehearsal of both plant and repair operations in blackout.

(k) Participation in air raid rehearsals and command post exercises.

Definite steps should be taken to connect public water supplies together wherever practicable. Details should be worked out as to manner of connecting supplies, other than approved public ones, but actual connections with them should not be made until approved by the state board of health.

Inventories of resources should be obtained, recorded and checked at least quarterly. (For a concise inventory form, see the Journal of the A.W.W.A. for February, 1942.) They may include those of the sewer department, of contractors and plumbers, and others. A definite plan must be made for quickly mobilizing these wherever needed.

The personnel of each water department should be increased if possible, the regular repair force being expanded for permanent repairs, and volunteers used for temporary repairs and less skilled activities. Some waterworks train their own employees—meter readers, clerical personnel and others—to conduct special repair operations.

Volunteers should, so far as possible, be selected from skilled workmen, such as plumbers. They may be organized and trained for utilization either by forming them into a separate gang to perform one or two specific types of work, or by integrating them into a regular waterworks organization; preferably the latter.

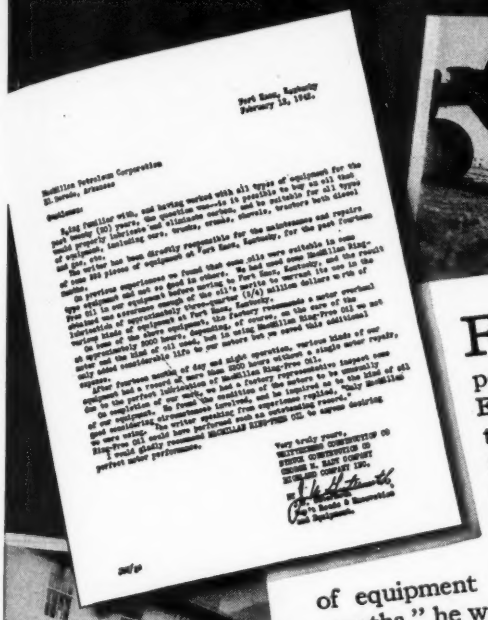
The Local Waterworks

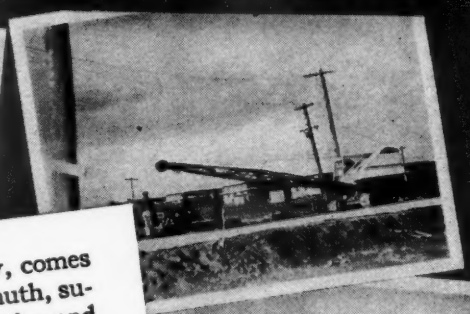
The mutual aid plan should not be considered as a substitute for the correction of local weaknesses, but only as a means of supplementing the resources of the local waterworks, which should maintain its own resources sufficient for all but extreme emergencies.

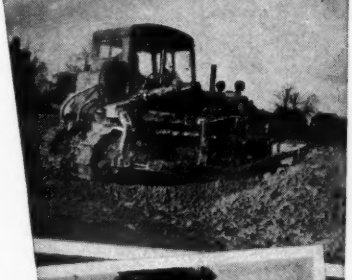
If the use of facilities of other departments is con-

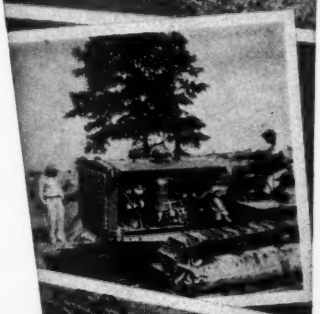
"An outstanding record" on 385 pieces of equipment

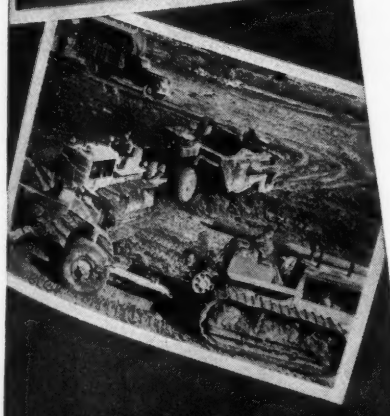
CARS • TRUCKS • CRANES • SHOVELS • DIESEL AND GAS TRACTORS











FROM FORT KNOX, Kentucky, comes a letter from J. W. Gutermuth, superintendent Roads and Excavation and Equipment for Whittenberg Construction Company, Struck Construction Company, George M. Eady Company, and Highland Company, Inc. He "has been directly responsible for the maintenance and repairs of some 385 pieces of equipment at Fort Knox for the past fourteen months," he writes in February, 1942.

In previous jobs, he says, some oils were good in some types of equipment "and not so good in others." His experience with Macmillan RING-FREE was reason enough for him to use it on $750,000 worth of equipment at Fort Knox.

On some of this equipment, the factory recommends overhauls at about 2,000 hours. But—

"After fourteen months of day and night operation," continues Mr. Gutermuth, "various kinds of our equipment had a record of more than 3,300 hours without a single motor repair, due to the perfect lubrication of Macmillan RING-FREE Oil."

When a factory representative inquired what oil had been used, Mr. Gutermuth replied:

"Only Macmillan RING-FREE Oil could have performed such an outstanding record.'

Whatever your equipment may be, write us, so that Macmillan RING-FREE can do for you what it is doing for others.

• • •

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50 West 50th St., New York
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MACMILLAN RING-FREE MOTOR OIL

templated, such as trucks of the street department, police radio service, fire department hose, etc., detailed arrangement should be made with those departments beforehand. The waterworks should arrange with the health department as to which is to issue warnings to boil water; with the fire department for emergency storage of water and use of auxiliary sources for fire fighting.

It is most important to have complete and accurate maps of the water distribution system.

Stores of repair parts and operating bases for repair crews should be distributed at strategic points throughout the city. British authorities stress the importance of establishing them on the outskirts, avoiding sites where destruction of a bridge or blocking of one street would interfere with their reaching promptly a damaged district.

Public buildings such as schools, water and sewage pumping stations, fire and police stations should be considered in selecting operating bases for light repair and gate crews of one or two men and a light truck. So valuable do the British consider such men that they release them from the army to serve in this capacity. The major duties of these crews are valving off sections of the system in damaged districts or target areas during a raid, making light repairs, and reporting to the waterworks office the extent of the damage. Mobility and speed are essential.

There should also be provided stations for emergency repair crews, where should be placed equipment and material forusual as well as emergency repairs for mains up to 20". Proximity to the homes of repair men and volunteers might well be considered in locating such stations.

There should also be one or more major repair depots, which should contain all types of materials, repair parts and equipment, including air compressors, pumps, heavy trucks, hoisting equipment and building materials.

Also portable chlorinators and water main disinfecting crews should be stationed at strategic points throughout the area.

It is particularly important that local waterworks participate in rehearsals or command post exercises which are called by local defense authorities. The coordination of every element of civilian defense is essential. Testing of equipment and personnel under conditions simulating those which would be imposed by an emergency will help to prepare an organization for the real test to which it may be subjected.

During air raids ordinary traffic will be stopped and the general public not permitted on the street. Those whose duties require them to proceed to their official stations may not be allowed to do so unless properly identified. Identification by means of arm bands for employees and flags or stickers for motor vehicles should be provided. Other means of identification, such as passes or cards may be necessary.

The Communication System

The efficiency with which the emergency water supply measures are carried out will depend in a large measure upon the communication systems. The importance of maintaining uninterrupted communication between the various units during an emergency cannot be overestimated. Full use should be made of existing facilities but such use should be coordinated with the communication requirements of other agencies in order that all essential services may be maintained during the emergency.

In general, the existing telephone system of the waterworks will form the groundwork upon which the final plans will be based. Flexibility and multiplicity of channels are desirable. In outlying areas or where cables may be destroyed, radio communication should be considered, such as police radio systems. Repair crews should have police receivers on their cars or trucks, two-way systems when practicable. Other communication channels to be considered are police telephone system, fire teletype, private telephone and teletype systems, telegraph and broadcasting companies, messenger services, and visual or auditory signal systems. (Boy scouts have done valuable messenger service in England. Ed.)

Exercises should be conducted to test the efficiency of the communication systems and suggest revisions to improve it.

The normal flow of messages from all sources will be to the Control Center, from which point the local Civilian Defense Commander can coordinate the activities of the various agencies. All requests for aid or information involving other agencies in the local civilian defense plan should *always* be routed through the Control Center. The following path of communication is suggested for use under conditions affecting the waterworks brought about by enemy action:

1. Report of damage reaches Air Raid Warden.
2. Air Raid Warden reports to the Control Center.
3. Control Center reports damage to the waterworks.
4. Waterworks orders nearest water gate crew to affected area to close valves and investigate extent of damage, or make minor repairs.
5. Gate crew reports closure of valves and extent of damage to waterworks.
6. Waterworks orders nearest available repair crew to proceed to site and institute repair work; then a report on the extent of damage and the action taken is furnished the Control Center.
7. Repair crew reports completion of work to waterworks.
8. Waterworks reports completion of work to Control Center.

The permanent repair crew would not ordinarily go into action until the raid had ceased, or until daylight. It has been demonstrated that it is not practical to repair water mains at night.

However, if it were necessary to bring water past the break for fire fighting purposes or for other urgent uses, emergency repair crews would immediately go into action to effect some type of temporary connection. If sufficient water for fire fighting purposes could not be furnished in this way, auxiliary supplies if available should be connected to the system by emergency repair crews, in accordance with pre-arranged plans.

If this fails, consideration might be given to the expedient of pumping non-potable water into the system. Such a course would be dangerous from the public health standpoint, and should be adopted only in case of a serious emergency, and then only after proper chlorination. Should this become necessary, portable pumps and chlorinators should be dispatched to the area. The health department should be notified of this action, and extreme care exercised in disinfecting the water to insure protection of the public health. Otherwise there is every possibility that a major waterborne epidemic might result which would be more disastrous than the action of the enemy.

A New Hampshire State road after using straight sodium chloride.

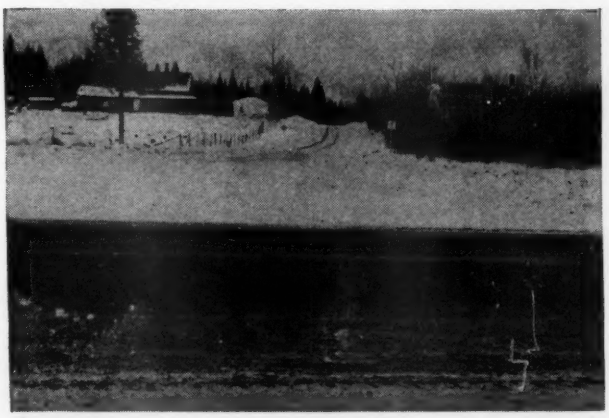
Ice Prevention Replaces Ice Removal in New Hampshire

Pavements kept free from snow and cost reduced fifty percent or more by spreading sodium chloride immediately after plowing instead of sanding as previously practiced.

IN NEW HAMPSHIRE, winter maintenance is practiced on approximately 2,900 miles of highway. On this mileage during the 1940-41 winter nearly 175,000 cubic yards of sand, which had previously been treated with 2,320 tons of sodium chloride to prevent freezing, had been used. When slippery conditions existed, sand was spread continuously along the center of the pavement. The cost of sanding these 2,900 miles was $562,253.82, which is more than 20% of the total funds expended for all maintenance of the state highway system of 3,540 miles. The total cost of winter maintenance during the same winter was $884,142.25.

Concerned at the growing cost of winter maintenance because of increasing mileage and the rising cost of sand, officials of the State Highway Department looked for a more satisfactory and less expensive means of providing safe traveling conditions on highways during the winter, and found that ice prevention by the use of sodium chloride of CC grade made safer driving and at less cost. Describing experiments conducted with sodium chloride, L. F. Johnson, maintenance engineer, said that the procedure followed was to spread a quarter of a pound of sodium chloride per square yard for a width of approximately two feet along the center of the pavements, immediately after the snow plowing had been completed.

"We had observed," he said, "that generally, immediately following a snow storm, the temperature remained above twenty degrees Fahrenheit for a short time. We hoped that this period would last sufficiently long to permit the chloride to dissolve and in doing so to clear the pavement of that snow which the plows were unable to remove. We also knew that freezing rains fell when the temperature was above twenty degrees Fahrenheit and that slowly falling rain should provide the moisture necessary to gradually dissolve the chloride, which would prevent the formation of ice on the pavement. This would permit reasonably safe motor travel during such a storm, which is impossible by the use of sanding methods. Results obtained following a few snowstorms and freezing



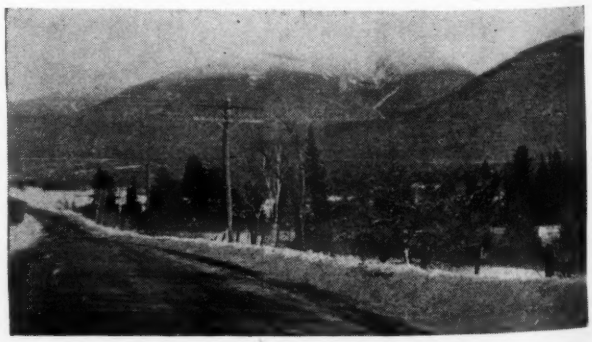
Junction of Route 16 and 110A; the former (in foreground) treated with sodium chloride, with road bare; the latter (in background) sanded, covered with compacted snow.

Spreading sodium chloride for ice prevention on New Hampshire highways. Most trucks use a tail gate but in this instance the spreader is supported by a chain.

rainstorms at the time we began our experiments proved the practicability of this procedure.

"When the first snow and freezing rain storms came this winter we obtained some excellent and some poor results. Upon checking the reason for this variation we found that many of the patrolmen had delayed spreading the sodium chloride until several hours after the snow plowing had been completed, in which instances the pavements were not free of compacted snow. In the locations where the sodium chloride was spread immediately after plowing had been completed, the entire pavement was cleared within a few hours.

"It is much easier to clear loose or compacted snow with chloride immediately after plowing is finished and while the temperature is in the twenties than after it has once frozen. From our experience, this cannot be emphasized too strongly. Ice prevention practiced at the proper time is simple and inexpensive while ice removal is much more expensive and difficult to obtain. Our success with sodium chloride is due to



A New Hampshire State road after using straight sodium chloride.

this, and the economies that have been effected stem from recognition of this principle.

"Freezing rains have been treated by spreading the chloride as soon as ice appeared on the pavement in the same manner as for snow storms. In most cases this has cleared the pavement so that travel at reasonable speeds was possible throughout the storm with safety. In some instances it was also necessary to spread sand on the grades, but when the storm was over, the entire pavement was free of ice.

"The average cost per cubic yard for sand spread on the pavement has been approximately $3.00. The cost of spreading sand at the low rate of two cubic yards per mile is $6.00, and when ice prevention is not practiced, one storm frequently requires many repeated sandings. The cost per mile for one application of chloride at 300 pounds per mile, which is usually enough to clear the full width of the pavement, is approximately $3.00. In addition to this saving, there is the immeasurable value of having pavements which are free of ice or compacted snow on which to travel. Ice prevention by using small amounts of CC sodium chloride has been proven to us as the best and most modern means of maintaining our highways during the winter months, providing of course that our men fully realize the need of making the application at the proper time. Ice prevention is a radical departure from our older method of trying to skid-proof ice or packed snow with abrasives, but ice prevention practiced on a State-wide scale last winter has proven that bare pavement maintenance costs less than the older method. We have found that we do not consume as many man-hours per mile per winter as when spreading abrasives, which is particularly important at this time when, due to defense work and Army conscription, we must do as much maintenance work with less men.

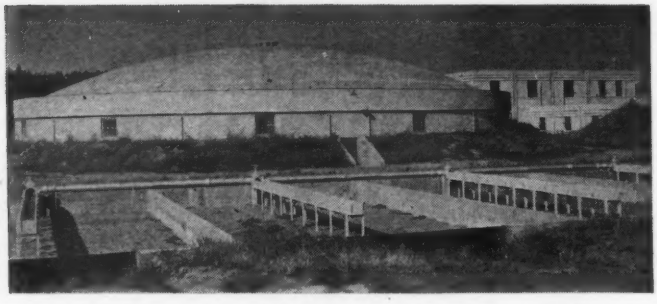
"One of our patrolmen designed a unit to spread the chloride which has proven very satisfactory. This spreader is very simple, as can be seen from the picture. We fabricate these spreaders in our own shop, and to date have used the machine for a long enough period to be satisfied that it does an excellent job of spreading CC grade sodium chloride."

How Springfield Got Water Pipe

Springfield, Mass., will receive $214,800 FWA aid in carrying out a $537,000 war-induced project for expanding its water system. The project calls for 50" pipe to connect the West Parish filters with a designated station, which pipe the city is able to furnish because of its foresight. Months ago it sent a buyer on a nation-wide quest for the necessary pipe. In St. Louis, he found a large quantity of 26" pipe of ¼" steel plate. Here he heard of second-hand pipe in a municipal stock-pile in Houston, flew there and bought it. The 26" pipe will be turned over to a contractor who will cut the pipe welds and re-roll the sections and refabricate them into 50" pipe.

Stock-Pile Asphalt for Repairing Roads

The Asphalt Institute has issued "Specifications CP-1 for Stock-Pile Asphalt Paving Mixtures" for making quick repairs of bombed surfaces. These call for a mixture of two sizes of aggregate with cut-back asphaltic binder, 94 to 96% of aggregate and 4 to 6% binder; mechanical mix, or road mix by travel plant or road blade and drag. The finished mixture will be stock-piled on a platform of 2" plank or other level storage place.



Brainerd sewage treatment plant. Concrete dome covers filter. Hitchcock & Estabrook, engineers.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Advancement of Sanitary Engineering

A 31-page report of the Committee on the Promotion of the Status of Sanitary Engineering "purports to outline the problems and activities of the sanitary engineer; to discuss the matter of his education and training; to indicate the present extent of opportunities for his professional activity and public service; to appraise and forecast the future possibilities of those services and endeavors; and finally to recommend means of improvement of the status and field of opportunity of the sanitary engineer."[K3]

Sewage Treatment At Appleton, Wis.

The sewage plant of Appleton, tributary population 34,000 with 5 mgd from industries, was designed for 10 mgd. Screenings from a bar screen are flushed into a Gruendler grinder, both operated automatically by time clocks. After adding Ferrisul the sewage is flocculated, settles in two circular clarifiers, is chlorinated in a contact tank. The sludge is raised by sludge pumps 52 ft. to four digesters on a hill, where 70,000 cfd of gas has been produced. Sludge is removed from the sludge beds and stockpiled, and made into fertilizer when time and weather permit. It is ground, and ammonium sulphate, phosphate and potash added to give an analysis of 5.17-2.07-2.10. All was sold in 1941, bringing $2,271.60.[G18]

Control of Sewage Gases

Of the gases expelled from septic sewage, hydrogen sulphide is by far the most odoriferous and destructive of metals and cement concrete and mortar. Sulphur acids are formed from the gas by aerobic organisms, and this action can be prevented by killing the organisms or exclusion of air. The formation of hydrogen sulphide from sulphates in the sewage can be *prevented* by supplying oxygen to satisfy the demands of the bacteria, or by suppressing bacterial activity and multiplication. It can be *corrected* by air blowing to sweep out the gas, by precipitating the sulphur by addition of chlorine, or by fixation of the sulphide by adding a copper or iron salt.

Oxidation by blowing air through the sewer has never proved practicable. Addition of nitrates is very expensive. Dilution with oxygen-bearing water is excellent where practicable.

Most of the bacterial action is due to the newly formed bacteria, and occurs when the temperature is above 70° F; at lower temperature no gas is formed. Cooling is impracticable, but multiplication can be prevented by partial disinfection at or near the point of origin of the sulphates; using from 2 ppm in cool weather to 12 ppm in warm sewage and long sewers. A hydrogen sulphide and chlorine-demand survey of the sewer system should be made to determine the most effective application points.

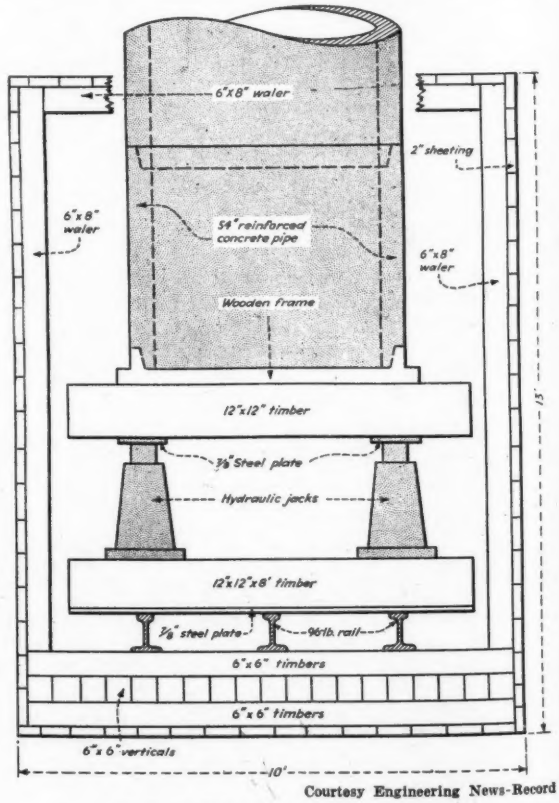
Air blowing at the plant has been used at Dallas, Tex., only. Most plants use chlorination, applied just ahead of the bar screens or in the pump well, usually 10 ppm. For destruction of sulphide after it has been produced, the most effective method is adding iron or copper salts, which convert the volatile sulphide into fixed metallic sulphide. Several plants use iron chloride produced by passing chlorine through scrap iron (the Scott-Darcy process). This does not produce the odor that direct chlorine often does, and gives 100% efficiency of the chlorine, while in direct chlorination the efficiency may be as low as 50%. If chlorinated iron is applied in a long sewer it remains available until used up.[G19]

*See Bibliography in the July issue.

Jacking Sewer Under Railroad

Warren, Ohio, jacked 148 ft. of 54" reinforced concrete sewer pipe under five railroad tracks at a labor cost of $4.31 a foot, estimated to be $15.24 less than the regular tunneling method, and eliminating danger of track settlement. Pipe 4 ft. long with shell 5½" thick and tongue and groove joints was used. The soil was clay with a high percentage of gravel. The overburden was about 14 ft.

On one side of the railroad, 6 ft. from the end of the ties, a pit 13 ft. long, 10 ft. wide and 11½ deep was sunk. The pressure end was built up with three layers of 6" x 6" timbers and three 96 lb. rails to take the thrust of the jacks. Two 9 ft. rails were laid to grade, each parallel to and 12" from the center line of sewer, and the bottom was then filled with concrete 8" thick. The first pipe had a manganese steel plate ½" thick and 18" wide fastened around the forward end as a shield and cutting edge.



Courtesy Engineering News-Record

Method of bracing and placing jacks.

Two 12" x 12" timbers and two 100-ton jacks were placed as shown in the illustration and forced the pipe forward. The soil was excavated by hand and removed through the pipe by wheelbarrows. Some boulders encountered were broken up with an air drill. Direction was controlled by the excavation and the relative pressures on the jacks. The greatest force exerted was 160 tons. The average progress was 9" per hour.[E10]

Sewer Maintenance

Little Rock, Ark., in maintaining 250 miles of 4" to 60" sewer, uses two crews, a routine trouble crew for small repairs, and a "big trouble" crew, which also constructs extensions. The former consists of 4 men using a 1-ton pick-up truck carrying a set of flexible rods and reel and 4", 6" and 8" augers and root cutters; two 100-ft. flat steel plumber's rods, 4 picks and shovels, sand, cement, oakum, 25 ft. of rope, cold chisel and pipe wrench. About 75% of the calls require only use of the plumber's flat cable; using a wad of baling wire instead of the usual spear or ball. For large roots or those far from the manhole the "flexible" equipment is used.

The major repair crew uses two trucks—a 1½-ton stake body and a 1-ton pick-up. The former carries a complete set of flexible rods (500 ft.), and picks, shovels, small tools, boots and rain suits; and the pick-up carries only picks, shovels and small tools. Tools and materials that are infrequently used are kept at a ware-room—two winches with 600 ft. of ⅜" steel cable, sewer buckets, culvert scrapers, air compressor, jackhammer, gasoline pump, "Flexible" power take-off, 600 ft. of fire hose, manhole jacks, sewer cleaning machine, construction materials, etc.[H37]

Operation of Gary Treatment Plant

The Gary, Ind., plant began normal operation in October, 1940. It is equipped for disposal of garbage with the sewage, but so far no garbage has been treated. The plant includes: Five 25" comminutors, the number operating varying with the flow from two to five; two 15 mgd electric and three 20 mgd gas engine pumps; five air blowers with total capacity of 35,000 cfm, two of them rotary displacement, the other three centrifugal; eight digestion tanks providing 6 cu. ft. per cap., five primary tanks and three secondary; two grit removal basins; four radial-flow primary settling tanks and eight similar tanks for final settling; ten straight through, spiral-flow aeration tanks, 5-hr. detention; sludge drying beds, 2 sq. ft. per cap., no underdrains. (See also "Digest" for October, 1940.)

Offices and laboratory are located in the power plant building, this being made possible by sound deadening and vibration dampening. The sludge bed is simply a leveled sandy area, and drainage goes down to the ground water. All piping is of steel protected with bitumen, spun inside and asbestos wrapped outside. The comminutors have given troublefree operation, but the rotating elements must be kept sharp for efficient operation. The primary tanks remove an average of 44% suspended solids and 37% B.O.D., aided by ferrous sulfate discharged by a steel plant averaging 4¼ ppm; when a slug of acid is passing through the plant, solids reduction has reached 95%, and averaged about 31% when no acid was present. Air consumption has been from 0.44 to 0.61 cu. ft. per gal. of sewage. Return sludge is kept at about 30% of the sewage flow. Best results are obtained by carrying solids in the aeration tank at 1500 ppm in winter and 1000 in summer. All tanks are kept operating in cold weather to prevent ice troubles. Average daily gas production during 1941 was 1.46 cu. ft. per capita; this furnished 87% to 100% of the blower power, and 44½ to 100% of the pumping power; total value for the year $22,771. The iron in the sewage causes some clogging of the diffuser tubes, the blower pressure rising from 7 psi with clean tubes to 8 psi, when the tubes are cleaned with a 10% solution of sulphuric acid.[G17]

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n.* note or short article; *p,* paper before a society (complete or abstract); *t,* technical article.

D *The Surveyor*
June 19
21. *p.* Effect of Chromium Compounds on the Activated Sludge Process. By S. H. Jenkins and C. H. Hewitt. Pp. 211-212.

E *Engineering News-Record*
July 2
10. Jacking a Sewer Under a Railroad. By W. S. Harvey. Pp. 74-76.
July 16
11. Emergency Treatment of Army Camp Sewage. By Frank Backmann. P. 85.

G *Water Works & Sewerage*
June
17. Operation of the Gary, Ind., Sewage Treatment Plant in 1941. By L. R. Howson and W. W. Mathews. Pp. 229-237.
18. Sewage Treatment at Appleton, Wis. By C. O. Baetz. Pp. 273-274.
19. Control of Odorous and Destructive Gases in Sewers and Treatment Plants. By Chas. C. Hommon. Pp. 277-280.

H *Sewage Works Engineering*
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37. Sewer Maintenance at Little Rock. By T. W. Clapham. Pp. 340-342.
38. Iron Sponge as an Aid to Sewage Gas Engine Operation. By R. W. Stafford. Pp. 343-344.
39. Sewage Treatment Plants in U. S. A. Pp. 353-356.

J *American City*
July
10. Putting Incinerator Operation on a Paying Basis. By H. J. Cates and R. G. Hicklin. Pp. 67-69.

L *Civil Engineering*
July
9. Sanitation for Military Posts. By Samuel A. Greeley and E. Sherman Chase. Pp. 359-362.

P *Public Works*
July
20. A Study of Laundry Waste Treatment. By Joseph A. McCarthy. Pp. 13-15, 38.
21. *c.* Relining an Old Brick Sewer. By John H. Barth. Pp. 21-22.
22. Renewals of Sewage Sprinkler Arms. By C. L. Gregson. P. 30.
23. Lining Sewer With Preformed Gunite. Pp. 32-33.
24. Sanitation at Contractors' Plants on Delaware Aqueduct. P. 34.

The War Emergency

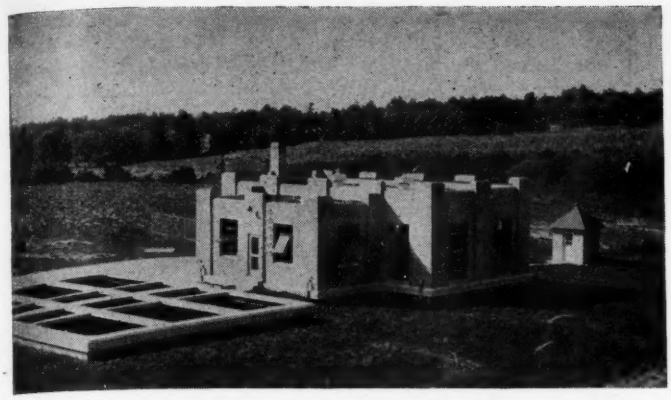
(Continued from page 7)

Emergency Specifications for Sulphate of Alumina

The A.W.W.A. Board of Directors on June 25 adopted a modification of the Association's specifications for sulfate of alumina, to apply only during the present emergency or until further changes seem necessary. The changes are as follows: The material shall contain not less than 14% water-soluble Alumina (former requirement was 17%); not more than 3% iron (formerly 0.75%); and not more than 15% of material insoluble in distilled water (formerly 7.5%).

F.W.A. Approval of Highway Projects

"Since Pearl Harbor, highway building and maintenance have had to be sharply curtailed. In consequence, with a few notable exceptions, the Public Roads Administration, through which the Federal Works Agency carries on its highway programs, is concentrating its efforts on providing access roads to areas of military, naval or wartime industrial concentration, and to remedying critical deficiencies in the strategic network. The chief deficiencies that are now being remedied are bridges too weak or too narrow to permit free movement of troop columns that include heavy tanks. Some reconstruction of narrow, winding sections is being approved, but this work is strictly limited to absolute necessity. The only highway projects which F.W.A. can approve at the present time are those that the War Department, Navy Department, Maritime Commission, or War Production Board has certified as indispensable to successful prosecution of the war."—*Excerpts from a communication from the Federal Works Administration dated July 11.*



General view of filter and pumping plant, Oldham County, Kentucky.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

Removing Iron At Sanford, Me.

Sanford, Me., population about 15,000, uses water from wells that contains 1.0 to 1.5 ppm of iron, 20 to 30 of CO_2 and a pH of 6.1. In 1936 a zeolite iron removal plant was installed, which removed the iron but it was difficult to maintain the pH high enough to prevent disintegration of the zeolite, although soda ash, sodium silicate and caustic soda were tried. After a year's experimenting with household size filters the zeolite filter was changed to 12" of fine sand on 10" of coarse sand on 8" of gravel, the brine heads being converted to a surface wash system. Air is injected into the water before it goes to the filter. After over a year of operation the sand was heavily coated with iron but still operated. To protect the pipes from corrosion by lime treatment, a pH of 9.75 is required, but as the water had a pH of 6.1 and CO_2 of 20 ppm, such treatment with lime would make the water too hard, and it is dosed with equal parts of soda ash and sodium silicate to give a pH of 7.5, which is proving satisfactory.[B11*]

Laying Submarine Pipe at Portland, Me.

In the winter of 1940-41 Portland Water District laid 2800 ft. of 8" pipe under Portland harbor to a Federal fortification on an island, the maximum depth at high tide being 40 ft. Steel pipe, lined inside and coated and wrapped outside, was used in 40 ft. lengths, connected with dresser couplings and three ball-and-socket joints. At each joint two lugs were welded to each pipe and connected with two cadmium-plated bolts, placed on the horizontal diameter of the pipe. A slip joint at each end of the line permitted 10" change in length. A line of piles were driven 40 ft. apart and 8 ft. from the pipe line to hold the dredge and lighter in place. The pipes were connected up on the lighter, a joint at a time, and lowered into the water. A 10 x 10 in. timber 8½ ft. long was so strapped on the pipe at each joint as to permit only the 4° deflection permissible in the dresser coupling. As each joint was completed, a piece of strong kraft paper was so fastened around it as to provide a trough, into which melted bituminous material was poured. When finished, there was only negligible leakage when tested at 100 lb. pressure. The work required 111 days of stormy winter weather and cost $52,171.[B12*]

Use of Hexametaphosphate

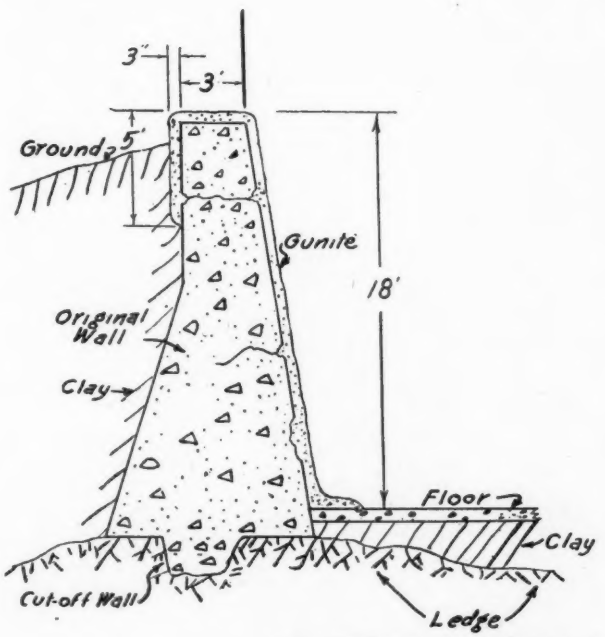
Metaphosphates are used in public water supplies to prevent precipitation of calcium carbonate, or red water due to the precipitation of dissolved iron from well water or to corrosion encountered in natural or treated waters, and to reduce tuberculation. Several hundred plants are using it. Corrosion is inhibited by formation of a thin film of metaphosphate on the surface of the metal, and formation of this increases with amount of water passing rather than with concentration in the water. A recent discovery is that it prevents precipitation of dissolved iron from well water. It apparently does not soften old corrosion products but does disperse old deposits, causing dirty water temporarily, in which case frequent thorough flushing of mains is recommended.

Since pipe surface increases only as the sq. rt. of pipe capacity, lower concentrations of metaphosphate are satisfactory in large cities with their large mains than in small ones. Recommended concentrations are: For over 10 mgd, 0.5 to 1 ppm; for 1 to 10 mgd, 1 ppm; for 0.5 to 1 mgd, 2 ppm; for less than 0.5 mgd, 4 ppm; at least double these figures being used at the start, until some metaphosphate is found at the extremities of the system.[B15*]

Lining a Leaking Reservoir

Auburn, Me., in 1907 completed a 6¼ mg reservoir, approximately square, consisting of a concrete wall about 930 ft. in circumference and a concrete floor on clay underlaid with more or less sound ledge. In constructing the wall it had been assumed that laitance was the best part of the concrete, as much as possible of this was brought to the top at the end of each day's run and the next day's run poured directly on top of it; and these joints leaked about 400,000 gpd, and spalled at the face during winters.

During 1923 and several succeeding years a clay



Courtesy New England Water Works Ass'n

Section of Auburn, Me., reservoir wall.

*See Bibliography in the July issue.

puddle wall was carried around the outside of the concrete wall. This stopped the leakage but each winter the clay was heaved by frost and had to be re-tamped. In 1940 permanent repair was attempted and apparently was successful, as pumping dropped 134,000 gpd, a farmer threatened suit because his wells dried up, and others complained of failing springs. The work cost $14,718 and the reduction in pumping saves $625 a year. In making these repairs, all unsound concrete was chipped out, cracks and joints enlarged to at least 6" wide and deep; the surfaces sandblasted and washed; reinforcement applied to the face, top and 5 ft. down the back of the wall, and 2" of gunite applied in two coats after first filling all depressions. In some places unsound concrete was removed 2 ft. deep. The gunite was kept wet for 4 days by means of a line of 2" pipe, with holes drilled every foot, laid along the top of the wall.[B13*]

Flow Test of 30-Inch Steel Pipe

A steel pipe coated with 3/32 in. of bitumastic and 30" net diameter, ten miles long was laid in Schuylkill County, Penn., in 1932 and tests showed a flow coefficient *C* of 140 to 145. After 8 yrs. of continuous service a flow test was made in November, 1940, from which it appeared that there had been no perceptible change in the coefficient *C* since the line was installed, that 140 is a safe value to use in connection with such pipe; and it was believed that the coefficient would not change unless something unforeseen should happen to the lining. There were no pipe growths, which was perhaps due to the fact that the water entering the line has always been chlorinated.[B7*]

Bottler's Traveling Laboratories

The Coca-Cola Company, to insure the suitability of the water used by its bottling plants (see "Digest" for June), uses a number of traveling laboratories. For these they use stock model 16-ft. trailers with minor construction changes. The lighting system and electrical apparatus are operated by plugging in at any convenient 110-volt a.c. outlet. Overhead fluorescent lights are used, and small emergency lights that can be operated by the automobile battery.

The basic apparatus consists of a specially designed water testing cabinet for volumetric determination of alkalinity, hardness, sulfates, chlorides, chlorine and iron; microscope and centrifuge for examining sediment and algae; bacteriological incubator; pH comparator, hot water bath and autoclave for total count and gas formers and complete bacteriological survey of the bottling operation; and dead-weight gage tester to check accuracy of pressure gages in the bottling plants. Also glassware, work tables, small sink, water storage and waste tanks, cabinets for books, etc.[A96]

Materials for Service Pipes

With copper pipe removed from the market, the author lists as substitutes, XS or XXS lead, cast iron with screwed joints (1¼" to 2" diameter), "Tube-Loy" (¾" to 2"), wrought iron, and plastic tubing ("Saran"). Lead requires skilled labor for wiping joints; is permanent, convenient and reliable. Cast iron is permanent; fittings required for changes in direction. "Tube-Loy" is relatively unproved; convenient, probably permanent, and can be joined, wiped, flared or sweated in fittings. Wrought iron is strong and tough, but requires fittings for changes in direction; permanency depends on character of water and of fittings. "Saran" is untried; for joints, the end is flared for use with flare fittings.[A97]

Result of Recent Filter Devices

At the Cornell University filter plant, one of the three 12x15 ft. filters was rebuilt in 1940 using Norton porous plates for the bottom, Anthrafilt as a filtering medium, and a Palmer "agitator." During more than a year of opera-

tion this filter gave results considerably better than those from the other two filters of more conventional construction. Clogging of plates has been very slight. Such a filter, with no classification of material, permits repairs and inspections to be made readily, without having to reclassify sand and gravel.

Several innovations in detail were introduced. The floor and walls of the filter were acid-proofed with a bitumastic enamel coating, and a system of ¾" Everdur pipes with perforated laterals was placed under the porous plates for introducing acid for cleaning them. Each plate was supported at three points, eliminating strain in setting and facilitating leveling. The plates were ground down to exact size (12" square) to give perfect joints; each having a rabbet on the top of every edge so as to form, at each joint, a groove ½" deep, ⅛" wide at the bottom and ¼" at the top, which was calked with a marine calking compound. This compound takes up considerable chlorine from the water, and it probably would be better to pour the joints with hot phenol-free asphalt.

The filter has been operating at rates ranging from 350,000 to 700,000 gpd. Some runs have exceeded 300 hrs. before washing.[A100]

Filter Backwash

Either rate of washwater rise or sand expansion may be used for regulating intensity of backwash. The former is only one of several factors which determine the percentage of sand expansion, other variables being washwater temperature (viscosity), and size, shape, grading and specific gravity of the filtering medium. The sand expansion indicates the combined effect of all these; by changing the velocity from time to time to maintain optimum and expansion, best filter operation is possible. Sand expansion increases with higher washwater velocity, colder water, coating of grains, and finer or more angular sand. Expansion is always governed by friction between water and sand surfaces. Dirt is removed from sand by abrasion and when friction between water and dirt overcomes adhesion between dirt and sand. Maintenance of clean filters by ordinary backwash procedure requires use of the coarsest sand consistent with satisfactory filtration results.[A98]

Maintaining Gate Valves

Every gate valve should be operated at least once a year; if not, they turn hard, in 90% of the cases because the packing gets hard and dry. The author removes the braided packing usually supplied by the manufacturer, squirts kerosene or light lubricating oil around the stem, and inserts a metallic plastic packing, with two or three strands of flax string-type packing on top. In large gates he drills a hole through the packing plate and inserts an alemite fitting, through which grease is forced by a grease gun. Large gates should have manholes large enough to permit a man to pack them. The gears of a geared valve should be enclosed in a housing with the gears running in oil. In setting a valve box, the base or pot should be set high so that stones that fall in can roll out of the bottom and not jam the operating nut. If the box cover gets sealed with tar or frozen in, burn a little gasoline on top of it.[G26]

Hydrant Maintenance

Each hydrant should be inspected each spring and fall, including a pressure test, which checks on the closing of the drip valve, reveals cracks, and proves whether nozzles are tight. This test should be compared with those previously taken (the time of day being noted). It sometimes gives the first clue to an underground leak. Paint all hydrants once a year. The author finds a semi-gloss paint most satisfactory. Spray pump painting saves no time and is wasteful of paint. For packing, he prefers jute impregnated with tallow, and graphite-base grease for lubrica-

tion. Cap chains are a nuisance for the firemen; and since removing them 10 years ago no caps have been lost.[G27]

"Blowing" Service Stoppages

Elgin, Ill., to clear services of stoppages caused by hard and corrosive water, operates as follows: The water meter is removed and a tank is connected by hose to the service at this point. Into the tank, full of air, water is forced at the bottom until the pressure is 1400 lb., a hand-operated hydraulic pump being used. Then a quick-opening valve releases into the pipe a "shot" of mixed air and water; the pipe is flushed out, and this blowing and flushing repeated until the flushing water runs clear. This cleans 70% of the services effectively, and only 1% are ruptured. To test the result and satisfy the consumer, the time to fill a 2-gallon can from a kitchen faucet before and after the blowing is noted by stop-watch. Less than 1400 lb. pressure fails to give results.[G29]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n.* note or short article; *p,* paper before a society (complete or abstract); *t,* technical article.

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95. U. S. Water Supply Practice. By A. E. Kelso. Pp. 984-1034.
96. Traveling Laboratory Control of Bottlers' Operation. By Bert Wells. Pp. 1035-1041.
97. Substitute and Alternate Materials for Service Pipe. By E. E. Smith. Pp. 1042-1044.
98. The Filter Backwash—Sand Expansion and Velocity. By Roberts Hulbert. Pp. 1045-1050.
99. Fundamentals of a Properly Designed and Properly Operated Filter. By Carl J. Lauter. Pp. 1051-1054.
100. Some Observations on Filters. By F. R. Georgia. Pp. 1055-1062.
101. Present Status of Tests for Organic Pollution Loads. By A. M. Buswell and E. C. Dunlop. Pp. 1063-1072.
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103. Standard Manhole Frames and Covers for Subsurface Structures. Pp. 1075-1101.

E *Engineering News-Record*
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18. Pipe Protection With a Thin Enamel Coat. By John J. Crowley. Pp. 80-82.
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64. Colorado River Reaches California Cities. By Julian Hinds. Pp. 768-772.
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26. Gate Valves: Their Care and Maintenance. By Roger W. Esty. Pp. 238-240.
27. Hydrant Maintenance. By E. T. Cranch. Pp. 241-243.
28. Water Waste Survey Has Saved Philadelphia 13 M.G.D. By Martin J. McLaughlin. Pp. 245-247.
29. Service Shooting. By La Verne Trentlage. Pp. 248-250.
30. Drilling and Developing Deep Wells. By J. Arthur Carr, Pp. 251-252.
31. Operation of Distribution System Under Bombing Conditions. By Richard Bennett. Pp. 261-265.
32. Experiences With Calgon Treatment at Bristol, Conn. By J. Laird Newell. Pp. 269-270.
33. Installation of Palmer Filter Bed Agitators. By Samuel H. Mitchell. Pp. 271-272.

J *American City*
July

16. Unifying Water Works Defense. Pp. 61-62.

M *Water & Sewage*
June

17. Deep Wells As a Source of Supply in Ontario. By A. T. Byram. Pp. 13-16.
18. Design and Operation of Swimming Pools. By Paul W. Reed. Pp. 17-20, 126.
19. Water and War. By George E. Symons. Pp. 22-24, 129.

P *Public Works*
July

25. Hanging a Water Main Under a Bridge. By H. M. Neighbour. P. 18.
26. *n.* Germicidal Efficiency of Hypochlorites. P. 18.
27. Some Water Works Practices in Small Communities. Pp. 19-20.
28. Treating a Bad Case of Ceratium at Hillsboro, Ill. By Fred A. Roemelin. P. 28.
29. *n.* Waterworks Maintenance in Reading, Mass. P. 33.
30. *n.* Proposed Ground Water Supplementary Supply for Rochester. Pp. 34-35.
31. Utilizing Elevated Storage for Increasing Supply and Economy. Pp. 35-36.

W *Johnson National Drillers Journal*
May-June

6. *c.* Use of Driven Wells for Small Supplies and Dewatering. Pp. 1-7.

Keeping Up With New Equipment

Industrial leaders map plans for work of American Industries Salvage Committee. Left to right: Oliver E. Mount; R. S. Wilson; Robert W. Wolcott, chairman; Charles R. Hook, vice chairman.

Salvage Committee to Speed Collection of Vital Scrap Material

Formation of the American Industries Salvage Committee, representing groups of leading industrial concerns who are working with the Conservation Division of the War Production Board to help speed the collection of vital scrap materials, has been announced by Robert W. Wolcott, chairman of the group and president of Lukens Steel Company.

Other members of the administrative committee directing the nation-wide $2,000,000 campaign are: Charles R. Hook, president of the American Rolling Mill Company, vice-chairman; R. S. Wilson, representing Rubber Manufacturers Association; and O. E. Mount, representing Steel Founders' Society of America.

The work of the committee, backing up a broad advertising program, will be two-fold: one, to reach every manufacturing and business firm in the nation to impress upon them the absolute necessity of getting their scrap on the way to the production line; and, two, to get business men cooperating with the local salvage committees of WPB already set up in 12,000 communities.

The activities of the committee will be closely coordinated with the present intensified scrap collection drive of the WPB, according to Mr. Wolcott. In this connection, the committee is underwriting the cost of an extensive national advertising campaign approved by the War Production Board, with a number of major industries underwriting the costs.

The advertising being carried on in newspapers, magazines, farm and trade papers and on the air, focuses the spotlight of public attention upon the need for iron and steel scrap, non-ferrous metals, rags, burlap, rubber, tin cans (in some localities), and waste cooking fats.

Supplementing contacts with industry already established by the Industrial Salvage Division of WPB, the American Industries Salvage Committee will make a direct approach to individual industrial concerns, working through industry chairmen who are now being appointed. Leaders in fifty industries are being asked to serve as chairmen for their respective trades in a broad effort to see that every company appoints a salvage manager with authority not only to clean out production scrap, but also to junk obsolescent equipment and similar material.

"Production of war equipment," Mr. Wolcott said, "is limited by the amount of raw materials which are available. Scrap is an important part of the raw-material supply. Industry must therefore do its utmost to increase its collection of scrap. We believe the efforts of the WPB in organizing and carrying out scrap collections have thus far produced excellent results. But the increasing demands of war call for still more scrap materials. The intensified campaign of the WPB deserves the wholehearted support of every industrial company.

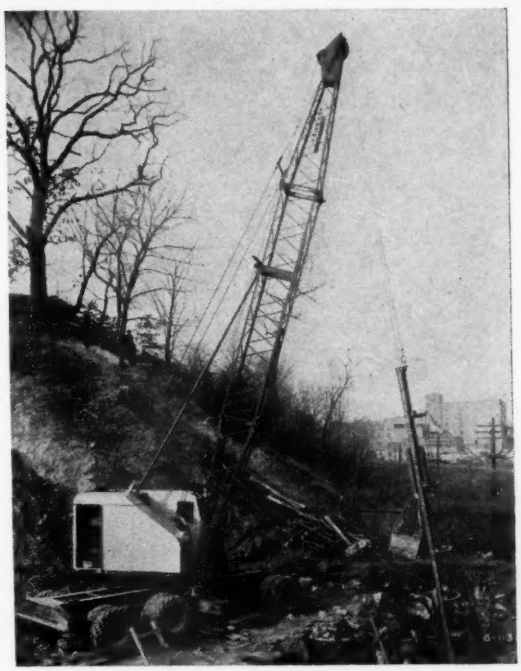
"We hope to release for war use unusual sources of scrap which may have been largely untapped, such as obsolescent machinery, unused dies and jigs, and other types of idle plant equipment. By carrying out this campaign on an industry-by-industry and company-by-company basis, we feel that we can gear the effort to the individual trade's scrap possibilities."

One Man Operated Truck Crane

General Excavator Co.
Marion, Ohio

One man operated, self propelled cranes on pneumatic tires are said to be an absolute "natural" for use in shipyards, at ports of embarkation and around industrial plants especially where greatly increased production has introduced yard storage problems. They are also used extensively for construction work to drive piling, excavate material and to assist in erecting structures. It is not unusual to see these cranes supporting booms as long as 100 feet.

This new type machine can roam at will and, provided as it is with an extra low gear, can negotiate unfavorable terrain which sometimes stops a conventional heavy duty motor truck. Because the wheel mounted crane is provided with an extra wide gauge, it has greater lifting capacity over the side than similar size locomotive and crawler type



This rubber tired General Supercrane moves in and out under its own power even where the going is rough and tough.

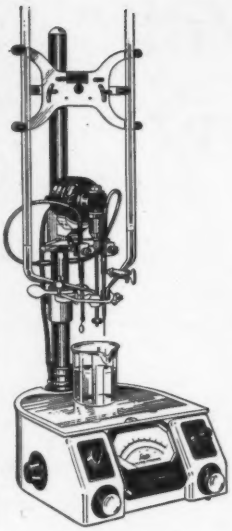
cranes and its comparatively long wheel base makes it exceptionally stable when traveling and carrying heavy loads suspended over front or rear.

In creating an improved, more efficient tool, the General Excavator Company conserves vital man-power, fuel and machinery, has a definite contribution toward winning the war.

Leitz G and D Electro-Titrator

E. Leitz, Inc.
730 Fifth Ave., New York, N. Y.

The Leitz G & D Electro-Titrator was designed by Drs. Garman and Droz for titrations which do not permit the use of an indicator or where indicators



Leitz G & D Electro-Titrator.

give inaccurate end points. It uses a highly sensitive and stable vacuum-tube voltmeter circuit (battery operated with exceedingly low current consumption of only 0.25 watts) for potentiometric oxidation-reduction titrations, precipitation titrations, as well as neutralization titrations. It can even be used for determining pH values.

The Titrator consists of a base housing containing the electrical equipment (including batteries) and an upright with the laboratory assembly (including a variable speed stirring motor). Several types of electrodes are offered, including glass and calomel electrodes for pH titrations.

The Titrator has two outstanding features:

(a) Changes of potential can be read *continuously* from a meter with 3⅛" scale. This is important in titrations with indistinct end points, more than one end point and pH titrations.

(b) The sensitivity is *variable* up to a maximum where even the minutest changes of potential produce considerable needle deflection (40 millivolts = 1" needle deflection).

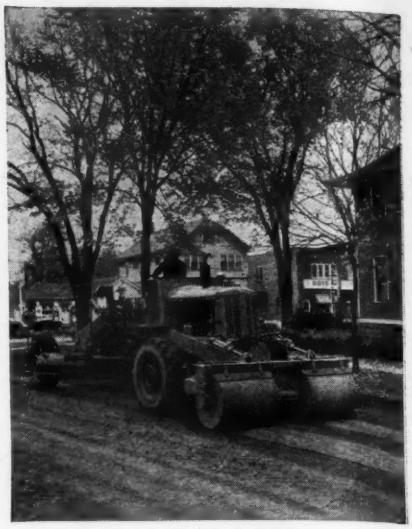
A booklet containing detailed description is distributed by E. Leitz, Inc., 730 Fifth Avenue, New York, N. Y.

Roller and Bulldozer Attachments for "99-M" Power Grader

Austin-Western Road Machinery Co. Aurora, Ill.

The roller attachment is of hollow

Austin-Western Grader with Bulldozer Attachment.



Austin-Western Grader with Roller Attachment.

welded steel construction with dished ends for greater strength and is mounted in a rigid ship-channel steel supporting frame which pivots from the rear bumper, a simple easy working hand lever on the dash controls the raising and lowering of the rolls by hydraulic power.

The rolls measure 2½ feet in diameter by 3 feet wide, are spaced 2 feet apart and are positioned to track behind the wheels and smooth out the tire marks. Rolls are mounted on a non-rotating axle, each is equipped with two bronze bushings and two spring tension scrapers. They are easily attached to or removed and in raised positions do not interfere with regular grading operations.

The bulldozer is constructed of welded steel, can be easily and quickly attached to or removed from the "99-M" grader and in raised position does not interfere with regular grader work. The moldboard is of formed steel plate, amply reinforced by six vertical steel ribs welded in position. The cutting bit is of high carbon steel and is bolted to bottom edge. The extra push of power in the front wheels of the "99-M" grader and the all-around steer, makes a very effective hook-up.

A powerful hydraulic ram, which actuates the bulldozer through a heavy connecting push rod, can also be used to operate a scarifier. When scarifier is used, a hook (provided as regular equipment) holds bulldozer in raised position so that push rod can be disconnected or removed. When bulldozer operates, special telescopic arms on scarifier are shortened so that tynes will not dig into the ground.

Write the manufacturer for complete information including specifications.

H. K. Clark Member of Army and Navy Munitions Board

H. K. Clark, vice-president and general manager of Norton Company, who recently returned to Worcester after nine months service as a dollar-a-year man in the OPM and WPB, lastly as Assistant Deputy Director of the Divi-

sion of Industry Operations, is back in the capital. This time he has been "drafted" by the Navy and with the rank of Lieutenant Commander is a member of the Army and Navy Munitions Board.

Frederick E. Kurz Passes Away

Central division manager for the Eimco Corporation. Died July 10th, 1942, at the age of 51 after an illness of two months, at the Elmhurst Hospital, Elmhurst, Ill. He had been actively engaged in the mining and filtration equipment fields during the past twenty-five years.

B. A. Poole Joins Sanitary Corps

B. A. Poole, Chief Engineer, Bureau of Sanitary Engineering, Indiana State Board of Health, has been commissioned a Captain in the Sanitary Corps of the Army. Joseph L. Quinn, who has been senior assistant, will be Acting Chief Engineer during Capt. Poole's absence.

Conventions and Association Meetings

Sept. 15-16—New England Water Works Association, Hotel Statler, Boston, Massachusetts.

Sept. 18 — Combined meeting of Western Pa. Section of A.W.W.A. and Penn. Water Works Operators' Assn., Hotel Roosevelt, Pittsburgh.

Sept. 21-23—North Dakota Water and Sewage Works Conference, Great Northern Hotel, Williston, N. D.

Sept. 23 — New England Sewage Works Association, Fall Meeting, Ocean Beach Pavilion, New London, Conn.

Oct. 7-9—Combined meeting of Four States Section and N. J. Section of A.W.W.A. and a Section Meeting of Pa. Water Works Operators' Assn. at Benjamin Franklin Hotel, Philadelphia.

Oct. 12-14 — Southwestern Section Meeting of the American Water Works Association, Marion Hotel, Little Rock, Ark.

Oct. 18-21—American Public Works Association's Annual Convention, Hotel Statler, Cleveland, Ohio.

Oct. 22-24—Federation of Sewage Works Association's Annual Convention, Hotel Statler, Cleveland, Ohio.

Oct. 27-30—American Public Health Association's Annual Meeting, Municipal Auditorium, St. Louis, Mo.

Oct. 28-30—California Section, A.W.W.A., meets at Oakland Hotel, Oakland, Calif.

New Appointments

New City and County Officials recently reported:

City Engineers

E. C. Coulter, Aurora, Colo.
Joseph L. Rose, Evanston, Ill.
Arthur O. Nordhelm, Galesburg, Ill.
John Rochel, New Iberia, La.
Howard L. Hamill, Swampscott, Mass.
Geo. F. Liddle, Muskegon, Mich.
Claude Postiff, St. Clair Shores, Mich.
Ralph E. Borrowman, St. Cloud, Minn.
E. Shaw Cole, Montclair, N. J.
Alton Worsley, Rocky Mount, N. C.
W. C. Howard, Pauls Valley, Okla.
James Timbrell, Berwick, Pa.
Jack F. Smith, University Park, Tex.
Ray Campbell, Laramie, Wyo.

City Managers

Edward M. Beardslee, DeLand, Fla.
C. E. Swank, Panama City, Fla.
Fred H. Howard, Tarpon Springs, Fla.
John F. Null, Acting, Benton Harbor, Mich.
Charles W. Baggott, Ludington, Mich.
Jim Parkinson, Portsmouth, Ohio.
Floyd E. Eoff, Norman, Okla.
Lloyd F. Kniffin, Milton, Pa.
Guy L. Webb, Knoxville, Tenn.
J. Thomas Kelley, Lufkin, Tex.
Guy L. Gearhart, Vinton, Va.
John E. Snyder, Acting, Morgantown, W. Va.

Public Works Superintendents

Michael G. Jelinek, Cicero, Ill.
Alfred Kemp, Barnesboro, Pa.

Water Works Superintendents

Lewis Starkey, Lafayette, Colo.
Walter Thomas, Littleton, Colo.
Willard Abel, Casey, Ill.
Harry B. Bemont, Chicago Heights, Ill.
Horace Frye, Evanston, Ill.
C. E. Whelpley, Forest Park, Ill.
W. A. Hendry, Waterloo, Iowa.
Louis Swartz, St. Clair Shores, Mich.
Chas. McCann, Egg Harbor City, N. J.
Ted Morris, Pauls Valley, Okla.
John D. Johnson, Erie, Pa.
Carl M. Cox, Lamesa, Tex.

County Engineers

V. E. Beck, Washington Co., Akron, Colo.
H. Max Hunter, Larimer Co., Fort Collins, Colo.
C. L. Varian, Ada Co., Boise, Idaho.
J. Frank Adair, Adams Co., Quincy, Ill.
Geo. E. Oltman, Shelby Co., Shelbyville, Ind.
Ellsworth Dean, Ripley Co., Versailles, Ind.
J. Lester Allen, Rawlins Co., Atwood, Kan.
T. S. Horner, West Carroll Parish, Oak Grove, La.
John E. Holmes, Alcona Co., Harrisville, Mich.
John H. Barr, Livingston Co., Howell, Mich.
Herbert M. McLaird, Faribault Co., Albert Lea, Minn.
Walter Pullen, Renville Co., Olivia, Minn.
W. C. Dunlap, Webster Co., Europa, Miss.
E. G. Hageman, Dunklin Co., Kennett, Mo.
George F. Rich, Union Co., Elizabeth, N. J.
B. R. Hebrank, Westmoreland Co., Greensburg, Pa.
L. H. Melton, Chester Co., Chester, S. C.
L. R. Stonecipher, Scott Co., Robbins, Tenn.

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Construction Materials and Equipment

Air Raid Shelters

3. New 8 page booklet pictures and describes a corrugated pipe shelter with gas tight end walls, emergency escape tunnel and other desirable features. Armco Drainage Products Assn., Middletown, Ohio.

Asphaltic Limestone

5. Characteristics, methods of laying, and results with cold lay mixture shipped ready to use. Especially adapted to resurfacing old pavements, sealcoats and airport runways. Alabama Asphaltic Limestone Co., Liberty Nat. Life Bldg., Birmingham, Ala.

Bridges

7. Teco Connectors, a new method of structural engineering, to spread the load on a timber joint more equally over the cross-section of the wood is described in new literature available from Timber Engineering Co., Inc., Dept. BS-2, 1319—18th St., N. W., Washington, D. C.

8. Lt.-weight, non-skid, mineral surfaced asphalt planks for any type bridge. Write for latest catalog. Servicised Products Corp., 6051 West 65th St., Chicago, Ill.

Cement Dispersion

9. "Economics of Cement Dispersion and Pozzolith" tells the complete story of how cement dispersion reduces water required up to 20% and increases workability 150%. Write The Master Builders Co., Cleveland, Ohio, for a copy.

Cement, Early Strength

11. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit, Mich.

Cold Mix Plants

15. New catalog and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus, Ohio.

Concrete Accelerators

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

33. Pocket manual of concrete curing with calcium chloride. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., 30 Rockefeller Plaza, N. Y. C.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

73. "Principles of Design of Airport Drainage" and other articles on airport drainage reprinted from PUBLIC WORKS Magazine are being distributed free by Bowerston Shale Co., Bowerston, O., Hancock Brick & Tile Co., Findlay, O., and Columbus Clay Mfg. Co., Blacklick, O. Address anyone of the above for a copy.

Graders, Patrol

105. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Road Machinery Co., Aurora, Ill.

Mud-Jack Method

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

Oil

109. Ring-Free Motor Oil that keeps motors clean and free from carbon, and reduces frequency of overhauls is described in literature available from Macmillan Petroleum Corp., 530 West 6th St., Los Angeles, Calif.

Paving Materials, Bituminous

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 ills. Write to The Barrett Div., 40 Rector St., New York, N. Y.

Pumps

120. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Portchester, N. Y.

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson. Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

Road Building and Maintenance

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio.

140. This well-illustrated 16-page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Road Mach. Co., Aurora, Ill.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

152. The Columbia Chemical Division will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Chemical Div., Pittsburgh Plate Glass Co., 30 Rockefeller Plaza, New York City.

154. "Soil Stabilization with Tarvia"—An illustrated booklet describing The steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Div., 40 Rector St., New York, N. Y.

Spreader

187. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be

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maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich., for Bulletin No. 29.

Timber Structures

189. "Typical Designs of Timber Structures" contains plans for 45 representative structures that have been engineered with Teco Connectors. For free copy write Timber Engineering Co., Inc., Room 6GG, 1319—18th St., N. W., Washington, D. C.

Street and Paving Maintenance

190. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. Tnese are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati, O.

198. Illustrated Bulletins 15 to 20 describe Mohawk Oil Burning Torches; "Hotstuf" Tar and Asphalt Heaters; Portable Trailer Tool Boxes; Pouring Pots and other equipment for street and highway maintenance, roofing, pipe coating, water proofing, etc. Mohawk Asphalt Heater Co., Frankfort, N. Y.

Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Co., Ford Bldg., Detroit, Mich., tells how to use calcium chloride for modern ice control.

Sanitary Engineering

Aero-Filter

356. "Results Produced by Aero-Filters" is a new pamphlet covering results at Temple, Texas; Paris, Ill.; Webster City, Iowa; and Mason, Mich. Write Lakeside Engineering Corp., 222 West Adams St., Chicago, Ill.

Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Activation and Aeration

376. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester, Mass.

Chlorinators, Portable

380. Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark, N. J.

381. "Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from Proportioneers, Inc., 96 Codding St., Providence, R. I.

Cleaning Mains

382. "Let's Look Into the Matter of Water Main Cleaning" is an illustrated booklet outlining the advantages of water main cleaning and explains how it can be done quickly and inexpensively by The National Method. Write National Water Main Cleaning Co., 30 Church St., New York, N. Y.

Cleaning Sewers With Own Forces

383. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

Consulting Engineers

385. "Who, What, Why" outlines briefly the functions of the consulting chemist and chemical engineer. Covers various methods of cooperation, on different types of problems, with industry, with attorneys and with individuals. Foster D. Snell, Inc., 305 Washington St., Brooklyn, N. Y., will send a copy on request.

Feeders, Chlorine, Amonia and Chemical

387. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. % 96 Codding St., Providence, R. I.

Filters

388. Anthrafilt for increasing filter capacity without adding filters. For full details write H. G. Turner, State College, Pa.

Fire Hydrants

390. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.

391. See listing No. 410.

Flow Meters

393. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Gates, Valves, Hydrants

394. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

396. See listing No. 410.

Gauges

398. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Manhole Covers and Inlets

402. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

Meters, Venturi

406. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders-Providence, Inc., Codding St., Providence, R. I.

Pipe, Cast Iron

408. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York, N. Y.

409. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

410. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa.

Pipe, Transite

414. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

Pipe Joints, Sewer

415. How to make a perfect sewer pipe joint—tight, prevents roots entering sewer, keeps lengths perfectly aligned; can be laid with water in trench or pipe. General instructions issued by L. A. Weston, Adams, Mass.

Pipe, 2-inch Cast Iron

417. Generously illustrated booklet describes McWane 2-inch cast iron pipe and its manufacture in streamlined pipe shop. Write McWane Cast Iron Pipe Co., Birmingham, Ala.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

Meter Setting and Testing

430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Reservoirs, Concrete

431. Data on how large reservoirs may be built at a saving as units by the Wm. S. Hewett System of reinforced concrete construction will be sent without obligation. The Wm. S. Hewett System, 20 N. Wacker Dr., Chicago, Ill.

Screens

434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.

Sludge Drying and Incineration

440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 48 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York, N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

Softening

444. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 4809-15 Tod Ave., East Chicago, Ind. Write for a copy of this instructive folder.

Sprinkling Filters

445. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

Swimming Pools

446. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

449. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y.

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

451. Powdered Hydrodarco for taste and odor control. For complete data on its use write Darco Corp., 60 East 42nd St., New York, N. Y.

Treatment

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

461. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York, N. Y.

Valves (See Gates, Air Release, etc.)

Waste Elimination

469. Full information on the Pitometer Survey—a complete check-up on your water plant to reveal hidden sources of waste—will be sent promptly by The Pitometer Co., 48 Church St., New York, N. Y.

Water Treatment

470. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., Inc., 4809—15 Tod Ave., East Chicago, Ind., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

471. Lime specifications and full impartial data on water treatment with lime may be obtained from National Lime Assn., 927 Fifteenth St., N. W., Washington, D. C.

472. Bulletin describes stabilizing lime-softened water by recarbonation, discussing gas production, washing, compressing, drying, and applying the CO(2). Infilco, Inc., 325 West 25th Place, Chicago, Ill.

473. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York, N. Y.

Water Works Operating Practices

490. "Important Factors in Coagulation" is an excellent review with bibliography and outlines of latest work done in the field. Written by Burton W. Graham and sent free on request to Stuart-Brumley Corp., 516 No. Charles St., Baltimore, Md.

Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.

LETTERS
to the Editor

The Operation of Water Treatment Plants

CALIFORNIA WATER SERVICE COMPANY
San Mateo, California

I have just finished reading your Second Edition of The Operation of Water Treatment Plants, which I think is the best and most comprehensive that has ever been published.

I am interested now in finding out whether this complete article will be issued in separately bound reprints, or not. I shall appreciate finding this out and in case it will be, the cost if any.

Yours very truly,
DONALD WINLACK
Chief Clerk

DEPARTMENT OF PUBLIC WORKS
Milwaukee, Wis.

I was informed by one of your representatives at the recent American Water Works Convention at Chicago that if a sufficient number of people were interested, you would reprint the article entitled "The Operation of Water Treatment Plants" which was published in your June, 1942, issue.

Your representative also informed me that the reprints, if made in large quantities, could be prepared for resale at a comparatively low price. If this can be done, there are about twenty (20) men at the Milwaukee Water Purification Plant who would be interested in purchasing this reprint.

Yours very truly,
JAMES E. KERSLAKE
Supt. of Filtration

Editor's note: Sorry no reprints are available. However, we make a special price for the June issue when 20 are ordered at one time.

New Solvay Book on Highways and Airport Runways

Solvay Sales Corporation
40 Rector St., New York, N. Y.

This book entitled "Better Bases for Better Surfaces" contains new information recently developed on design and construction of bases for highways and airport runway pavements. It condenses information from recent reports which show the varying amounts of compaction and density necessary to assure ultimate stability of various types of graded aggregate bases. It also includes new information on methods which will both insure proper density and at the same time effect substantial savings in water and compactive effort. Other sections cover the treatment of bases for frost prevention, and specifications used in the construction of bases with various types of materials. Write for a copy.

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